

Strategic flood risk assessments

A GOOD PRACTICE GUIDE



Introduction

Getting the right kind of development in the right places will ensure that today's growth is resilient to tomorrow's climate. This is a key ambition of the [national flood and coastal erosion risk management strategy for England](#) (2020). Land use choices through spatial planning can help to achieve flood and coastal erosion resilience in places as well as wider environmental benefits.

The purpose of this guide

The [National Planning Policy Framework](#) (Department for Levelling Up, Housing and Communities, 2021) requires local planning authorities (LPAs) to produce Strategic Flood Risk Assessments (SFRA) and use them as evidence to inform [local development plans](#) and policies.



This guide provides practical information and advice for LPAs, and others who support them, on how to scope, produce and use an SFRA to fulfil national policy requirements efficiently and effectively. This can create time and cost savings whilst achieving good outcomes.

This guide supports existing Environment Agency guidance '[how to prepare a strategic flood risk assessment](#)' and government guidance on how to apply the [sequential test](#) and [exception test](#). Evidence shows that existing guidance is applied well to assess flood risks from main rivers, the sea, and ordinary watercourses. Further advice is provided here to ensure that other sources of flooding, from surface water, groundwater, sewers, reservoirs and canals, are also assessed, when scoping, developing and using the SFRA.

The advice has been informed by research undertaken by the Environment Agency (2018-2019) ([FRS18204: Using flood risk information in spatial planning](#)), and in consultation with others who

provide advice on spatial planning. Case studies have been reproduced from existing assessments, plans and policies with the kind permission of the councils referenced. Over time, new SFRA may provide other examples. These should be shared using existing networks (for example ADEPT and CIWEM) to continue peer to peer learning.

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Who is this guide for?

Local Planning Authority policy officers (and consultants working on their behalf) who:

- Commission and review SFRAs to inform local planning and development documents, policies and allocations, and to apply the sequential test and, where relevant, the exception test.
- Prepare strategic plans for the local area, e.g. infrastructure studies, green infrastructure strategies, which need to be informed by flood risk evidence.
- Need to consider future climate adaptation or relocation requirements.

Local Planning Authority development management officers, who:

- Assess planning applications using SFRAs to provide guidance and examples to case officers and applicants.
- Set criteria for future development in areas of flood risk.
- Prepare Community Infrastructure Levy charging schedules and policies on S106 developer contributions.

Risk management authorities (RMAs)*, who:

- Provide flood risk data and advice to planning authorities for SFRAs.
- Develop future flood risk management options and schemes, and bids for funding.
- Develop other documents for flood risk management (for example Local Flood Risk Management Strategies).
- * *Organisations with a statutory role in flood and coastal erosion risk management (includes the Environment Agency, lead local flood authorities (unitary and county councils), district councils (who are also coastal management authorities), internal drainage boards, water and sewerage companies, and highways authorities (highways teams in unitary/county councils and Highways England).*

There are other bodies who may be consulted to provide flood risk information and advice to inform the evidence in an SFRA. This can include the Canal and River Trust, reservoir owners, other infrastructure owners, coastal groups and community flood groups. They may also find this guide helpful when supporting their local planning authority. This guide may also be useful for organisations assembling flood risk information to support the preparation of a Neighbourhood Plan, Neighbourhood Development Order, Local Development Order or Community Right to Build Order.

Outcomes: Using planning policy to ensure today's growth is resilient to tomorrow's climate

National planning policy and guidance in England

In England, the [National Planning Policy Framework \(NPPF\)](#) sets out the government's planning policies and how these should be applied, including managing flood risk and requirements for local planning authorities to produce a Strategic Flood Risk Assessment. The [Planning Practice Guidance on Flood Risk and Coastal Change \(PPG\)](#) advises how to take account of the NPPF policies and address the risks associated with flooding. There is also the [PPG on the Natural Environment](#) which sets out how delivering environmental net gains and enhancements to ecosystem services can alleviate flood risk. The Environment Agency's guidance [How to prepare a Strategic Flood Risk Assessment \(SFRA\)](#) explains what information local planning authorities in England need to include in a SFRA, and how it should be used. This guide (strategic flood risk assessments good practice guide) provides further detailed technical advice and examples of how to apply that guidance. This has been developed to encourage SFRAs to enable good outcomes for flood resilient places.

National planning policy in England seeks to ensure that flood risk is avoided, reduced, managed and mitigated effectively. It strives to deliver a number of outcomes that ensure today's growth is resilient to tomorrow's climate. By using this guide, SFRAs will be produced and used in such a way that will ensure the following outcomes can be achieved.

Outcome 1 – Development is located in areas of lowest risk from all sources accounting for the predicted impacts of climate change

The best way to avoid the risk of flooding to new development is to ensure that it is located in areas at the lowest risk of flooding from all sources (main rivers and 'ordinary' watercourses, the sea, surface water, groundwater, sewers and reservoirs/artificial sources like canals). A development that, for example, has been located away from areas of high river or sea flood risk yet remains vulnerable to a high risk of surface water flooding may not be the most sustainable option. If all sources of flooding are considered when applying the decision-making tests embedded in planning policy, sites at lowest risk of flooding will be allocated for development in preference to those at greater risk.

Outcome 2 – Inappropriate development is avoided in areas that will become unsustainable in the future

The risk of flooding is anticipated to get worse over time due to climate change, either through new areas becoming at risk of flooding for the first time (e.g. areas currently in a lower risk flood zone become defined as a higher risk flood zone), or through the consequences of flooding becoming more severe, e.g. increased depths of floodwater. The desired outcome is long term sustainable decisions on the appropriate location, types and design of development are made, informed by climate change information on all sources of flooding.

Outcome 3 – Land is safeguarded for current and future flood risk management purposes

The desired outcome is for a ‘no regrets’ approach to be employed whereby the value of land that helps to manage flood risk should be recognised and considered when making development decisions. In practice, this means safeguarding land and infrastructure that is needed for current and future flood risk management so that it is protected from development.



This may include land for new and/or improved flood defences (for the purpose of protecting existing communities), land where floodplains may expand in the future, land for flood storage schemes, and land for relocating communities.

Outcome 4 – Cumulative impacts of development and land-use change on flood risk have been identified and addressed

New development and changes to land use can affect the risk of flooding in an area. The desired outcome is that development proposals and decisions assess and address the cumulative impact on the risk of flooding by including measures that avoid future increases to flood risk through incremental development.

Outcome 5 – Opportunities have been taken to reduce existing levels of flood risk

If LPAs and RMAs work collaboratively when producing flood risk evidence base documents, such as the SFRA, opportunities can be identified where future development or redevelopment could reduce the existing causes and impacts of flooding. SFRAs can identify opportunities to reduce flood risks, such as constructing or co-funding new flood defences or improvements to existing defences, strategic sustainable drainage systems (SuDS) or natural flood management techniques such as watercourse restoration or culvert removal. Implementing these opportunities can be driven by supplementary planning documents or flood risk management projects that are evidenced by the SFRA. The desired outcome is that all appropriate opportunities in spatial planning are used to identify and implement measures that reduce the causes and impacts of flooding to existing communities now and in the future. This is in addition to the requirements for new development not increasing flooding under the NPPF.

Outcome 6 – Flood risk evidence base informs plans and policies

The SFRA is part of the evidence base for the local plan. It supports the Strategic Environmental Assessment process and should be used to develop local planning policies. Producing an SFRA for the Local Development Plan should not be seen as an end in itself. It should also inform: any supplementary planning guidance on flood risk management; water cycle strategies, land assessment studies; future development allocations; development management policies, emergency plans; growth and infrastructure plans; green infrastructure plans; planning obligations (including Community Infrastructure Levy, Section 106¹ or Section 278² Agreements, etc.); future relocation planning, and how flood risk management is to be considered when determining planning applications.

The outcome of this is that development is directed to areas of lowest risk of flooding from all sources, development in areas of flood risk can be made safe throughout its lifetime without increasing flood risk elsewhere, and local policies (for flood risk management or development) are consistent with the evidence base.

Outcome 7 – Residual risk of flooding is safely managed



If, having used the sequential and exception tests, development is approved in areas at increased risk of flooding, any remaining 'residual risk' should also be safely managed. This will ensure people will not be exposed to hazardous flooding or other unacceptable risks such as building structural instability caused by flooding. Residual risks include those that result from the failure or overtopping of flood defences, the blockage of drainage systems, failures in flood forecasting or flood warning issue, receipt or response, and failure of active measures such as demountable flood barriers. The desired outcome is that

residual flood risks are first minimised by taking a sequential approach to locating the buildings in areas of the site at lowest risk, raising floor levels and thresholds, managing site levels (where appropriate), raising vulnerable uses to upper floors and that appropriate passive flood resistance and recovery measures have been incorporated.

Proposals for new development should be supported by flood risk emergency plans as described in the ADEPT and Environment Agency guidance document: [Flood risk emergency plans for new development](#). The NPPF requires these plans to form part of the Flood Risk Assessment provided for a new development or and may be stipulated in LPA local guidance or policy.

Achieving wider outcomes

A comprehensive SFRA provides evidence for the local plan. Once that evidence has been produced for this reason it can also underpin many core local government activities, including:

¹ Section 106 of the Town & Country Planning Act 1990

² Section 278 of the Highways Act 1980

- Achieving strategic objectives. Projects, plans and processes informed by an SFRA can build in resilience to flood risk and climate change. These will be more effective and sustainable over the long-term.
- Reducing impacts on service demand and delivery by allowing assets and activities to continue performing as the climate changes.
- Reduced financial costs. Many studies show that adaptation action is generally cheaper, and more effective over time than the costs incurred responding to the impacts over time (although individual actions need careful evaluation). The short-term costs from the impacts of extreme weather events can also be significantly reduced, such as highway and building repairs, temporary accommodation, mental health and social care support. Proactive adaptation is a key part of ensuring LPAs continue providing value for money to the taxpayer.
- Meeting statutory requirements for planning, flood risk management and public health.
- Delivering multiple benefits. SFRAs can identify opportunities to reduce flood risk through measures such as multifunctional sustainable drainage systems or natural flood management techniques that can help to improve biodiversity (net-gain) and provide wider environmental net gain and amenity benefits. Adaptation actions can also deliver wider benefits such as improving health and wellbeing, property values, skills and employment, reducing emissions and storing carbon.

These outcomes can be achieved if the SFRA is appropriately scoped, produced, reviewed and used. The information in the following pages provide advice on how to do this, based on consultation with local planning authorities and others. This supports the existing guidance [‘how to prepare a strategic flood risk assessment’](#).

Scoping, producing and using an SFRA: Rules of thumb

There are some general 'rules of thumb' that can be applied to ensure that the SFRA meets planning policy requirements in the most effective and efficient way.

Engage early and widely

Work collaboratively

Be comprehensive

Take a digital approach

Update often

Share it and use it

These approaches can have time and cost savings, better outcomes as evidenced in the Environment Agency research '[FRS18204: Using flood risk information in spatial planning](#)' (2021). Some local planning authority officers' experiences include:

"Savings of up to 50% or more were estimated between the cost of a combined SFRA compared with the total cost if all the LPAs produced their own individual SFRA. Officers noted that collaborative working meant costs and roles could be shared between LPAs. For example, with one managing the project, another developing the webpages to host the SFRA outputs and remaining costs being shared appropriately amongst the LPAs."

"Having previously liaised with the Environment Agency I had contacts from whom I was able to request an example scope and ask for assistance reviewing briefs at commissioning stage."

"The interactive PDFs (within the SFRA) have been well received. They are much more usable and are being used internally as well as by developers and the public"

"For some local areas there was a need for a more bespoke approach that provided greater detail than national policy guidance. The local flood risk standing advice developed for our area in collaboration with the Environment Agency provided that consistent and robust planning support."

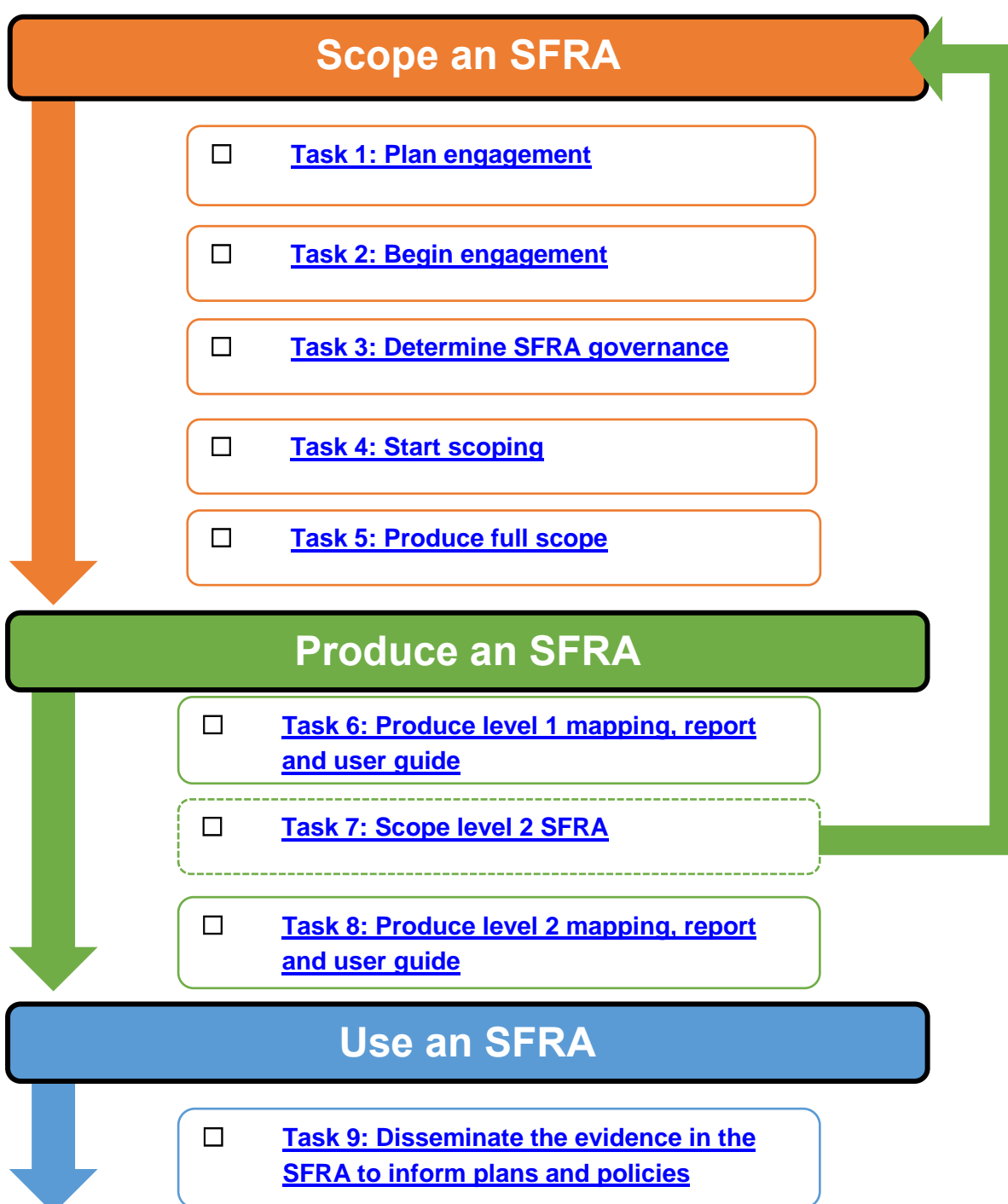
"The SFRA enabled the preparation of better policies in relation to surface water management that were previously not considered by developers."

"The SFRA provided clear recommendations which were translated into local plan policies."

"The SFRA feeds into planning for green infrastructure, suitable alternative natural greenspaces, and safeguarded space for flood storage areas."

Scoping, producing and using an SFRA: Checklist

The guidance for [how to prepare a strategic flood risk assessment](#) describes which level of SFRA to produce. All local planning authorities need to produce a level 1 SFRA to allocate land for development. A level 2 SFRA is needed if development cannot be located outside flood risk areas. The guidance below supplements the guidance with good practice approaches that have been found through research and can be shared to support peer to peer learning. The checklist can help LPAs scope, produce and use SFRA that create good outcomes for flood risk management. The tasks are described in more detail in the following section.



SCOPING

Scoping an SFRA

The [SFRA Guidance](#) online describes all the requirements of a Level 1 SFRA, and what it should contain. This includes information on how the SFRA helps the LPA, how others will use it, and when to review and update it. It also provides guidance on how to produce an SFRA with other local planning authorities and who to consult when producing the SFRA.

The guidance below supplements the guidance with good practice approaches that have been found through research and can be shared to support peer to peer learning.

Task 1 Plan engagement

1.1 Identify RMAs and others to work with to advise, support and use the SFRA.

Good practice:
[Collaborative working](#)

Outcome:
[Outcome 3: Land is safeguarded for current and future FRM purposes](#)

[Outcome 5: Opportunities have been taken to reduce existing levels of flood risk](#)

[Outcome 6: Flood risk evidence base informs plans and policies](#)

The SFRA should be prepared at the earliest stages of the local plan development so it can influence local policy.

Local planning authorities (LPAs) should work with statutory flood risk management authorities, and other organisations involved in flood risk management when developing the SFRA, even if they are not statutory consultees on the local plan. If the LPA is not an upper tier authority, early consultation with the lead local flood authority (LLFA) is essential to inform wider engagement with other organisations. The following organisations and groups should be engaged early to understand what advice, information and support they can provide to the SFRA scoping and development. These include as a minimum:

- Environment Agency (including planning, flood, reservoir and groundwater teams)
- Lead local flood authority (top tier local authorities)
- Coastal protection authorities
- Internal drainage boards (IDBs)
- Water and sewerage companies
- Canal and Rivers Trust
- Local resilience forum
- Local emergency planning team
- Local emergency services
- Highways England and/or highway authority
- Parish councils
- Regional flood and coastal committees
- Neighbouring LLFAs if appropriate
- Catchment partnerships
- Minerals and Waste services

And where appropriate:

- Land owners
- Reservoir owners
- Coastal groups
- Utilities or statutory undertakers
- Public (local flood risk groups)

Early engagement is key to understanding what resources are available to support the SFRA process. For example, if LLFAs cover several LPAs they may have more limited resource to be able to support multiple SFRAs. The arrangements for LPA collaboration with the LLFA will depend on the local government structure and any specific arrangements to aid this process in two-tier authorities. In areas with [IDBs](#), LPAs should engage early with the IDB to understand any Byelaws and information on the drainage districts.

Key questions to consider:

- What are the key flooding issues in the LPA area (consider all flood sources)?
- Which organisations have statutory roles to advise and manage those issues?
- What are the existing collaboration agreements between these organisations?
- Which other organisations / groups may be able to support the SFRA (with data for example)?
- How can other organisations / groups get involved?
- What strategies and plans will inform the SFRA (e.g. shoreline management plans, local flood risk management strategies, drainage and wastewater management plans)?
- What interventions are already in place to reduce flood risk (either private or government funded schemes)?
- What activities in the SFRA scoping and development can the other organisations support (e.g. provide plans and data to identify where existing levels of flood risk have been or can be reduced, and where land needs to be safeguarded for future)?

1.2 Identify neighbouring LPAs to collaboratively develop the SFRA

Good practice:

[Collaborative working](#)

[Comprehensive scoping of the SFRA](#)

[Considering flood risk at a strategic scale](#)

Outcome:

[Outcome 4: Cumulative impacts of development and land-use change on flood risk are identified and addressed](#)

[Outcome 5: Opportunities have been taken to reduce existing levels of flood risk](#)

[Outcome 6: Flood risk evidence base informs plans and policies](#)

Where possible, LPAs should collaborate with neighbouring LPAs to facilitate effective planning policies developed at a catchment scale. This can provide benefits including better understanding flood risk issues; sharing resources; reduced costs for producing the SFRA; improved opportunities for flood risk management; and better opportunities for establishing a consistent approach to implementing planning policy for achieving flood risk resilience across the area. This is particularly important to establish in two-tier authorities, or where there are national parks, and where sources of flooding transcends LPA boundaries.

Where the LPA is a lower tier authority it should collaborate with the upper tier authority as they will have some planning duties. Upper tier authorities that produce SFRAs for minerals and waste should consult the LPA. National parks who are LPAs and produce the SFRA should collaborate with neighbouring LPAs, especially if they are within the same district.

Consider working with neighbouring authorities, particularly:

- LPAs in two-tier authorities
- LPAs that are national parks
- LPAs with shared flood risk issues
- LPAs that have existing arrangements for collaborative working
- LPAs that cross over single river catchments
- LPAs that are reliant on the flood risk management infrastructure upstream or downstream of the LPA area
- LPAs with settlements that border or cross local authority boundaries

This may be limited where neighbouring LPAs are all at different stages in the Local Plan production, however there may be opportunities to collaborate over time as and when appropriate. Further information on approaches to collaboration is provided in the Good practice section of this guide.

Key questions to consider:

- Are there cross-boundary flooding issues?
- What are the local catchments for rivers, surface water, groundwater and reservoirs, and for the sea (e.g. coastal cells and estuaries)? How do these catchments compare to local authority boundaries? (Data on the [catchment explorer](#) website may help).
- Does the size of the river catchment, or other type of flood catchment area, indicate that a collaborative approach with other LPAs would have advantages?
- Does the flood risk differ across the local authority area? Does this require different collaboration approaches in one SFRA?
- Does the flood risk in different parts of the local authority area require collaboration with different local planning authorities?
- What are the existing collaboration agreements between these organisations?
- Where are the flood risk impacts of developments felt? Would downstream impacts affect neighbouring local authorities?
- What stage in the Local Plan process are the neighbouring authorities? What are the opportunities for collaborating?
- What local flood strategies and plans can inform a catchment wide assessment?

1.3 Identify teams within the local authority who need to support and use the SFRA**Good practice:**[Collaborative working](#)[Comprehensive scoping of the SFRA](#)**Outcome:**[Outcome 6: Flood risk evidence base informs plans and policies](#)

SFRAs and other evidence base studies are often delivered by (or commissioned by) spatial planning teams within the local planning authority, but successful SFRAs that inform decisions and policies rely on engagement and collaboration across teams within the local planning authority.

Identify who is likely to be involved in producing the SFRA (providing advice, data, resources), or who will use the SFRA. This can also identify opportunities for joint working, sharing data and delivering multiple benefits.

Teams to involve could include:

- Flood risk management (including lead local flood authority teams)
- Emergency planning
- Development Management
- Urban design
- Economic development and regeneration
- Estates
- Housing
- Open space and parks
- Infrastructure planning
- Highways development management and operational delivery
- Environmental assessment
- Biodiversity
- Geographic Information System (GIS), data management, IT/digital services
- Communications

Key questions to consider:

- Which teams in the local authority will use the SFRA to inform plans and policies?
- Which teams need to be consulted to make sure the SFRA meets the needs of others?
- How/when will the LPA engage with other teams when scoping and developing the SFRA?
- How will the LPA ensure the needs of the stakeholders are met?
- How will the teams be encouraged to use the SFRA?

Task 2 Begin engagement**Good practice:**[Collaborative working](#)**Outcome:**

2.1 Hold early discussions

[Putting appropriate governance in place for implementing the SFRA](#)

[Outcome 6: Flood risk evidence base informs plans and policies](#)

The local planning authority should hold early discussions with the identified stakeholders and interested parties to inform the project scope. The key questions below can help to steer the early scope discussions.

Key questions to consider:

- Which policies and plans will the SFRA support?
- What is the timeline for policy development and how does the SFRA factor into this?
- What is determining the study area and extent?
- What is determining the study programme (assessment, consultation and embedding)?
- Who could provide data? Are there data sharing agreements?
- Who needs to be part of the project governance (decision making roles)?
- Where approaches are yet unknown (i.e. applying climate change allowances to groundwater flood risk) how will these approaches be agreed?
- Can the work be undertaken by the local planning authority or does it require bought in services?

Task 3 Determine SFRA governance**3.1 Establish governance arrangements****Good practice:**

[Collaborative working](#)

[Putting appropriate governance in place for implementing the SFRA](#)

[SFRA is accessible and easy to update](#)

Outcome:

[Outcome 6: Flood risk evidence base informs plans and policies](#)

Appropriate governance should be in place to manage the engagement with other parties, to deliver a quality SFRA and help embed the evidence into policies and plans. Governance for an SFRA may include representatives from RMA (particularly the LLFAs) and other organisations who will support and use the SFRA. It may be efficient to use the same governance as the local plan.

Determine the governance arrangements when scoping, producing, implementing and updating the SFRA (each stage may need different governance). Consider whether a steering group is needed for the SFRA and flood risk matters going forward. This could be incorporated into the remit of an existing group or forum.

The governance will need to identify who in the local planning authority (LPA) will be responsible for updating datasets and keeping the SFRA up to date. It should be agreed when an SFRA update is required and the specific triggers that would start this process (see [SFRA Guidance](#)). If the SFRA is put together as a dynamic or “live” document or dataset the update process can be more efficient.

If a specific steering group has been set up as part of the production of the SFRA, plan for how this will continue following this iteration of the SFRA and the remit of the steering group. Getting support from external data suppliers for future updates is also critical to the process.

Key questions to consider:

- Which LPA team will lead the study?
- What governance structure is required?
- Which organisations/ teams need to have representatives on the project team?
- Is creating a new group or using an existing one the most effective way to establish the governance arrangements?
- What level of representation is needed to ensure the SFRA is used?
- How will any potential conflicts between stakeholders be resolved?
- What are the triggers for updating the SFRA?
- What are the arrangements for maintaining and updating the SFRA?
- What data will be required, from whom, how will it be collected?

- How will the effectiveness of the SFRA be monitored (including how they inform planning decisions, other plans or policies)?
- Will the SFRA need to be formally adopted by the Local Authority (or Authorities) and if so, what are the arrangements for this?

Task 4 Start scoping

4.1 Set up formal meetings and begin to scope the SFRA

Good practice:

[Collaborative working](#)

[Comprehensive scoping of the SFRA](#)

[SFRA is accessible and easy to update](#)

Outcome:

[Outcome 1: Development is located in areas of lowest risk of flooding from all sources, whilst not increasing flood risk to others](#)

[Outcome 3: Land is safeguarded for current and future FRM purposes](#)

[Outcome 5: Opportunities have been taken to reduce existing levels of flood risk](#)

[Outcome 6: Flood risk evidence base informs plans and policies](#)

[Outcome 7: Residual risk of flooding is safely managed](#)

Tasks to scope the SFRA should begin once governance arrangements have been determined and early engagement has been undertaken with stakeholders and interested parties.

One of the first tasks will be to agree:

- The SFRA study area and extent
- The SFRA programme
- Who will produce the SFRA
- What the SFRA will be used for
- The opportunities that will be taken throughout the SFRA for collaboration and achieving wider outcomes
- Any issues that the SFRA will need to address
- The desired outcome for each interested party
- The outputs needed from the SFRA (for example proformas for site allocations, report, website, online maps)
- Who will deliver the SFRA (in-house team or contractors)

Key questions to consider:

- What are the timescales needed for each activity?
- How will the outputs of the SFRA be disseminated and published? Does this impact on how the SFRA needs to be scoped and delivered? (For example, does the local authority already have an online mapping portal that could be expanded to include the flood risk evidence base?)
- How will its outputs be maintained and updated as datasets / flood risk management approaches / policies change?
- Have the long-term efficiencies of having an online mapping tool been considered?
- Does the local authority have a team that can co-ordinate this data management, or is support from neighbouring authorities or consultants required?
- Will the local authority need support beyond the SFRA (for example, at planning inspector hearings or representations to inspectors)?
- Has the scope of the assessment, its inputs, spatial extent, limitations, timescales and programme for preparation, review, revisions and agreement, been agreed?

- Does the programme of activities allow enough time to apply the assessment to the proposed Local Development Plan policies, allocations and examinations? Are engagement activities for the SFRA and local plan aligned?

4.2 Gather data from RMAs and external partners, collaborating LPAs and internal teams within the local authority

Good practice:

[Collaborative working](#)

[Comprehensive scoping of the SFRA](#)

[Taking account of specific local flooding characteristics](#)

Outcome:

[Outcome 1: Development is located in areas of lowest risk of flooding from all sources, whilst not increasing flood risk to others](#)

[Outcome 3: Land is safeguarded for current and future FRM purposes](#)

[Outcome 5: Opportunities have been taken to reduce existing levels of flood risk](#)

[Outcome 7: Residual risk of flooding is safely managed](#)

A large task of the SFRA is to gather data that is available across the local authority, and from other organisations and interested parties (see task 1). The LPA will need to establish what data is available, how it can be shared, how it will be used to validate other datasets (for example local modelling used to check Environment Agency maps).

The early scoping should establish:

- What data and information is available to support the SFRA
- How this will be gathered and timeframes for doing this
- The limitations of that data and whether new data is required (for example new flood modelling)
- How any new modelling will be subject to an appropriate and transparent quality assurance process (if new modelling is to be assimilated into Environment Agency products like the flood zones, they will need to undertake this quality assurance exercise)

Once the availability has been established, the data can be requested and gathered. Data requests should be clear, stating the data and format needed.

Such data will include:

- Historic flood risk reports and studies from all parties involved in flood and water management
- Significant or designated assets that affect flood risk
- Flood probability and impacts data (representing current and future climate scenarios)
- Existing or planned flood risk management activity
- Prospective allocation sites
- Existing flood risk management work underway within the scope area
- Existing strategies and plans that will frame the SFRA scope, for example the Local Flood Risk Management Strategy, River Basin Management Plans, and Flood Risk Management Plans.

Requests should be made allowing for enough time for the requests to be processed and any discussions to be had regarding its quality and limitations.

Key questions to consider:

- What will the data be used for?
- What data is held by which organisation, and do they have specific data sharing agreements (e.g. non-disclosure agreements or data sharing agreement)? (Note, Environment Agency and internal drainage boards may have hydrological models they can provide, as well as the inputs and outputs. Parish Councils may provide anecdotal information and photographic records).
- What are the formats of the available data and will this affect how it can be used?
- Are there any gaps or issues with accuracy that will cause a problem? (For example, data on ordinary watercourses can be limited compared with main rivers).
- How will these data gaps be addressed?
- Have all relevant flood risk management authorities been consulted to request available data?

- When will the data be updated and how will this be included in the SFRA?
- What are the data gaps and how will these be filled?
- What assumptions need to be made (for data gaps or accuracy limitations), and how will uncertainty impact on the SFRA outputs?

Task 5 Produce the full scope or specification

Consider:

- All the feedback and information gathered from the previous tasks
- The activities that need to be undertaken within the project/contract (including any new modelling for ordinary watercourses, surface water, sewer flooding, reservoirs/artificial sources like canals, and groundwater risk for present day and future climates)
- The required timescales to undertake the activities, and whether this fits with local plan development
- What outcomes need to be achieved
- What detail needs to be included (for example the types of outputs needed, data management, data availability and quality, new data needs, IPR and access rights)
- The resources required to deliver the SFRA

PRODUCING

Task 6 Produce Level 1 mapping, report and user guide

The [SFRA Guidance](#) online describes all the requirements of a Level 1 SFRA, and what it should contain. The Level 1 SFRA should include enough detail to identify whether it's possible to allocate land for all development outside flood risk areas. This will inform the Sequential Tests.

Flood risk areas should:

- be based on all sources of flooding (main rivers, ordinary watercourses, sea and estuaries, surface water, reservoirs and artificial sources, groundwater and sewers)
- take climate change into account
- not consider flood risk management features and structures unless:
 - they might increase the extent of flooding
 - they are in particular locations where it is deemed they need to be included (this should be decided with the Environment Agency).

The guidance below supplements the [SFRA Guidance](#) with approaches that have been found through research and can be shared to support peer to peer learning.

6.1 Assess all sources of flooding

Good Practice:

[Assessing surface water flood risk](#)

[Assessing groundwater flood risk](#)

[Assessing flood risk from artificial sources](#)

Outcome:

[Outcome 1: Development is located in areas of lowest risk of flooding from all sources, whilst not increasing flood risk to others](#)

Evidence has found that existing guidance and practice is strong for assessing flood risks from main rivers and the sea, but not for ordinary watercourses, surface water, groundwater and artificial sources. There is not one single way to do this, and there could be several approaches. Engaging with other LPAs to share approaches may help in this process.

Key questions to consider:

- Have all sources of flooding been identified and are they within the study area?
- What information is held on flooding from main rivers, seas and estuaries, ordinary watercourses, surface water, groundwater, sewers and reservoirs / artificial sources that could be used in planning decisions?
- Does additional work need to be completed to identify key 'at risk' areas (e.g. where historic records indicate increased frequency of flooding)?
- How will the SFRA compare the risk of flooding from surface water, groundwater, ordinary watercourses or sewer system to the risk from other flood sources in the area (i.e. the frequency and consequences of flooding)?
- Are there interactions between different sources of flooding that could exacerbate the risk of flooding?

Surface water:

- How does the risk of surface water flooding compare (i.e. the frequency and consequences of flooding) to the risk from other sources in the area?
- Do historic records or references from local knowledge differ to other available information (e.g. the risk of flooding from surface water maps online) and does this need investigating through the SFRA?
- Is there any information (e.g. hydraulic modelling) that indicates that future changes in surface water flooding would exacerbate flood risk from other sources or vice versa?
- What approach will be used to consider surface water flooding when applying the sequential test to potential development allocations?

Groundwater:

- Is there evidence to indicate that groundwater will exacerbate other sources of flooding or vice versa?
- How does the risk of groundwater flooding (the probability and consequences) compare to the risk from other sources in the area?
- What approach will be used to apply the sequential approach to this source of flooding when testing potential development allocations?
- Are any areas at risk of long lasting and/or deep groundwater flooding where spatial planning decisions should be informed by the sequential approach or safe and resilient development design?

Artificial sources:

- Who needs to be consulted when development is proposed in areas at risk of flooding from reservoirs, canals, sewers (public foul and surface water sewers) and any other artificial sources?
- What approach will be used to apply the sequential approach to this source of flooding when testing potential development allocations?

6.2 Create risk zones for all flood risks to determine how the sequential test will be applied

Good Practice:

[Applying the sequential approach based on all sources of flooding](#)

Outcome:

[Outcome 1: Development is located in areas of lowest risk of flooding from all sources, whilst not increasing flood risk to others](#)

The sequential test will be applied using the flood risk information in the SFRA to ensure a sequential approach is used to steer development to the areas of lowest risk of flooding.

The approach for applying this to fluvial and tidal flooding information are well practiced. But evidence shows that for other sources of flooding, which are difficult to separate into risk zones this can be more difficult. There is no adopted national planning guidance in England for how to approach this, and it is therefore for the LPA undertaking the process to decide. This is a critical part of assessing 'all sources of flood risk' and LPAs should consider the appropriate approach for applying this to site assessment.

LPAs may want to consider how to compare risks of flooding from other sources to risks of flooding from rivers and the sea, and create associated flood zones. This may be more straightforward for surface water where one approach could be to assess risks of flooding in terms of low, medium and high risk, with equivalence to the return period definitions used for fluvial flood zones.

This may be more challenging for other flood sources. Relevant risk management authorities should be consulted to acquire relevant information or advice on producing any new data that may be required. Any additional flood modelling or approaches should be proportionate to the level of risk in the local planning authority boundary.

The risks of flooding from all sources should be presented consistently, and applied consistently to decisions about development locations.

LPAs should also obtain any information from site promoters, through the call for sites process, that is needed to apply the sequential test. This might include information about the proposed density and distribution of development across the site, for example.

Key questions to consider:

- What approach will be used to consider surface water, reservoir and groundwater flood risk, as well as fluvial and tidal flood risk when applying the sequential test?
- Does the intended approach need to be endorsed by the flood risk management authorities?
- Can the SFRA be used to develop a locally appropriate way of comparing these different sources of risks to enable consistent decision making that takes into account all sources of flood risk?
- What information can you get from site promoters through the call for sites process to apply the sequential test (e.g. proposed density and distribution of development across the site)?

6.3 Assess the cumulative impacts of development and land-use change

Good Practice:

[Assessing and managing the](#)

Outcome:

[Outcome 4: Cumulative impacts of development and land-use](#)

[cumulative impact of development on flood risk](#)

[change on flood risk are identified and addressed](#)

National policy requires LPAs to consider cumulative impacts in, or affecting, local areas susceptible to flooding.

This should include any impact expected from:

- strategically planned development
- windfall development
- permitted development
- significant changes in land use, such as paving over domestic gardens or reforestation of uplands

Key questions to consider:

- What are the potential impacts of multiple planned developments within the same catchment area?
- How might the likely development within the authority area contribute to the cumulative impact (particularly catchments that have lots of windfall development)?
- Are there any significant land use change in the area (e.g. strategic sites or large settlements) that should be considered?
- How can the SFRA be used to assess how sensitive catchments are to the cumulative effect of development (e.g. is there opportunity to produce scenarios or sensitivity tests to demonstrate “what if” situations)?
- How can the SFRA inform decisions about the locations of development and local plan policies, ensuring that the cumulative effect of development on flood risk within sensitive catchments is appropriately managed?
- How can any cumulative impact from windfall sites be planned and managed?
- Is the assessment of the cumulative impacts of development adequate if the development is beyond local authority boundary?
- Does land within the same catchment need safeguarding to mitigate impacts of cumulative development?

6.4 Assess the expected effects of climate change

Good Practice:
[Assessing and managing the impact of climate change on flood risk](#)

Outcome:
[Outcome 2: Inappropriate development is avoided in areas that will become unsustainable in the future](#)

The SFRA should:

- assess the effects of climate change on all sources of flooding
- identify areas on maps where climate change is expected to increase flood risk
- identify on maps where the effects of climate change are expected to make existing development unsustainable

This will help identify any development that may need to be relocated to sustainable locations.

Climate change information will need to be applied to assess future flood risks. Climate change guidance for [England](#) sets out the allowances that need to be applied to sea levels, peak rainfall intensity and peak river flows. These allowances are routinely applied when undertaking modelling studies for river and sea flood risk to consider the impact of climate change. Similar modelling can be done for surface water, to include consideration of climate change using the allowances for peak rainfall intensity. The LPA should consider where this information will come from or how it will be produced if it is not readily available.

There is currently no national guidance on how to assess the impact of climate change on the risk of flooding from groundwater, sewers or reservoirs and other artificial sources. If a locally agreed approach is to be used, this should be agreed by the SFRA governance and any relevant stakeholders.

Safeguarding land for current and future flood risk management purposes

The SFRA should highlight the need to safeguard areas of land that are likely to be needed for flood risk management. This task should be undertaken collaboratively with the LLFA and the Environment Agency and other stakeholders that could inform this process. The LPA should use this information in their Local Plan to allocate areas to safeguard from any development that would prevent or hinder such measures from being delivered (for example, flood storage areas, or areas of planned flood resilience measures).

Key questions to consider:

- Have an appropriate range of climate change allowances been assessed to understand how climate change is likely to affect flooding from all sources?
- What approach will the SFRA take to assess climate change impacts on groundwater, reservoir and sewer flooding?
- Will the SFRA be updated when any new climate change allowances are updated? If it won't, what recommendations may it need to include for any new climate change allowances to be applied in future decision making?
- Has land been identified to safeguard for future flood defence infrastructure?
- What lifetime should the development be designed to and how might this affect the need to safeguard land for future flood management?
- Has/will the SFRA information be used to inform local climate change adaptation plans?

6.5 Identify opportunities to reduce the causes and impact of flooding**Good Practice:**

[Identifying and using measures to reduce the risk of flooding](#)

Outcome:

[Outcome 5: Opportunities are taken to reduce existing levels of flood risk \(net gain\)](#)

The SFRA should also refer to relevant strategic flood risk documents to identify opportunities to reduce the causes and impacts of flooding. This may include identifying areas of existing development that could be earmarked for a change of use in future years to deliver a flood storage function.

The SFRA should consider holistic catchment approaches to minimising flood risk, i.e. where developments upstream of flood risk areas may provide measures that will slow the flow of water from upstream to downstream in order to provide a wider benefit. LPAs can use their local plan policies and allocations to provide developers with more clarity about what will be expected of them in relation to reducing the causes and impacts of flooding and, where relevant, satisfying the second part of the exception test.

The SFRA can play an important part as the evidence base to inform policies that can help to reduce flood risks and adapt to living with the risk of flooding, not just manage existing and potential new risks.

The LPA should engage with the RMAs to get advice and information that can inform appropriate approaches to help identify where flooding causes and impacts can be reduced.

Key questions to consider:

- Have development proposals maximised their potential to reduce existing flood risk as well as mitigating any risk they may cause themselves? This may also be referred to as providing a "betterment".
- Does evidence on future levels of flood risk due to climate change provide a catalyst to help progress opportunities to reduce existing levels of flood risk? How can this be applied to policy or site allocations if so.
- Have locations upstream of flood risk areas been fully explored to assess if measures implemented there could help reduce risk downstream? This will apply even where the upstream development is not shown to be at risk.
- Have flood risk management authorities helped to identify opportunities to reduce the causes and impacts of flooding through development?
- Have flood risk management authorities helped to identify opportunities to adapt development to flood risk, as part of the SFRA?

6.6 Requirements for windfall sites**Good Practice:**

[Providing guidance on requirements for windfall sites](#)

Outcome:

[Outcome 2: Inappropriate development is avoided in areas that will become unsustainable in the future](#)

The local plan site allocations will identify what type of development should take place over the life time of the plan period. There will still be instances where other parties subsequently propose development (residential and non-residential) in additional areas, which are referred to as 'windfall' sites.

The SFRA should form part of an evidence base for developers to use early on when considering where to locate development proposals as part of the call for sites process and designation of allocated sites through the local plan, and for local authority development management officers to use when reviewing applications for windfall developments.

Key questions to consider:

- Can the sequential test be applied to all sources of flooding, if so what policy requirements may be needed?
- How will the sequential test be applied to all sources of flooding and what policy requirements may be needed to assist this?
- Are there locations where windfall sites are likely to come forward which are at flood risk?

6.7 Consult on the Level 1 SFRA

Consider:

- The rules of thumb:
 - Engage early and widely
 - Work collaboratively
 - Be comprehensive
 - Take a digital approach
 - Update often
 - Share it and use it.
- Other engagement that may be happening for the local plan
- The needs of the stakeholders and teams reviewing the SFRA
- Who else could provide advice on how to apply the sequential test to windfall sites (e.g. other risk management authorities).
- The need to identify 'critical drainage areas' in the local plan / SFRA or other designation which may allow for the sequential test to be applied to windfall sites for fluvial and other sources of flooding. This will need to be a locally agreed approach.

Task 7 Scope Level 2 SFRA

A Level 2 SFRA is needed if either:

- all land for development cannot be allocated outside flood risk areas (as identified in Level 1 SFRA)
- all land for development can be allocated outside flood risk areas, but the LPA believe high numbers of applications in flood risk areas will be submitted for sites not identified in the local plan

A Level 2 SFRA should be detailed enough to identify which development allocation sites have the least risk of flooding. It should identify the severity and variation of risk within medium and high flood risk areas, so that the sequential test can be applied, and contain enough information to apply the exception test, if relevant. It should also include information to enable decisions about whether development can be made safe throughout their lifetime without increasing risk elsewhere.

If a Level 2 SFRA is needed, revisit the tasks 1 - 5 to ensure it is adequately scoped and engages with relevant stakeholders.

Use the Level 1 report to inform and update the scope for your Level 2 study, considering any data quality or availability issues raised by the Level 1 study, and if locations that require detailed assessment were identified. The Level 2 SFRA may need site specific maps and information describing the nature of the flood risks identified (including depth, velocity, breach etc.). This may require more data to be gathered

and produced if it is not available from relevant stakeholders. Further information is provided in the [SFRA Guidance](#) online to determine whether a Level 2 SFRA is needed and what it should contain.

Consider:

- All the feedback and information gathered from the previous tasks
- What approvals or endorsements may be needed for setting localised criteria to define areas of flood risk and justify that development can not be located within these
- The activities that need to be undertaken within the project/contract (including any new modelling for ordinary watercourses, surface water, and groundwater risk for present day and future climates, and reservoir/artificial sources breach modelling)
- What are the required timescales for completing the Level 2 SFRA
- What outcomes need to be achieved
- What detail needs to be included (for example the types of outputs needed, data management, data availability and quality, new data needs, IPR and access rights)
- The resources required to deliver the SFRA

Task 8 Produce Level 2 mapping, report and user guide

The [SFRA Guidance](#) online describes all the requirements of a Level 2 SFRA, and what it should contain. It should:

- be detailed enough to identify which development allocation sites have the least risk of flooding
- contain the information needed to apply the exception test, if relevant
- enable LPAs to decide if development can be made safe without increasing flood risk elsewhere

It should allow LPAs to:

- apply the [sequential test](#) by identifying the severity and variation in risk within medium and high flood risk areas
- establish whether proposed allocations are capable of being made safe throughout their lifetime without increasing flood risk elsewhere (information on development type, density and layout are useful for this)
- apply the [exception test](#), where relevant (the LPA may give a general steer in the SFRA on whether the exception test can be passed, but it will be the developers who apply the exception test)

The guidance below supplements the guidance with approaches that have been found through research and can be shared to support peer to peer learning.

Key questions to consider:

- Are those producing policies able to access and engage with the outputs of the SFRA?
- Will the level 1 and level 2 SFRA be produced early enough in the process to inform local policy and site policies?
- Does the SFRA provide evidence on specific local flood risk considerations that need to be written into local plan policies (for example climate change, self builds etc)?
- How can the outputs from the SFRA be most effectively shared across other teams within the LPA?
- Are there clear recommendations on how local plan policies should respond to the findings and priorities from the SFRA (for example are local policies or supplementary planning documents required)?
- How are any recommendations distinct from, or build upon, any recommendations identified in the Level 1 report and user guide?
- Will the sequential test be carried out within the SFRA Level 2 report, or should it be a separate assessment?
- Has the Level 2 report provided information to enable both parts of the exception test to be undertaken?

- Does the SFRA contain sufficient information to identify the flood risks and opportunities posed by development, to enable the LPA to weigh these up against any wider sustainability benefits to the community when undertaking the exception test, as needed, for proposed site allocations?

8.1 Information for assessing the safety of the development

Good Practice:
[Safely managing residual risk](#)

Outcome:
[Outcome 7: Residual risk of flooding is safely managed](#)

The Level 2 SFRA should include information to allow the LPA to decide whether proposed development is capable of being:

- made safe from flooding for its lifetime
- designed so it will not increase flood risk elsewhere
- safeguards land for flood risk management, where applicable.

The LPA should consult with emergency planning authorities and local resilience fora and development management teams to agree principles and processes for safe design.

Key questions to consider:

- Has the local authority emergency planning team and other emergency responders been engaged to develop principles for assessing safe design (see : [Flood risk emergency plans for new development guidance](#))?
- Do the local flood characteristics trigger the need for supplementary (or other form of) planning guidance for developers on requirements for safe and flood-resilient design in areas with flood risk identified for development?

8.2 Consult on the Level 2 SFRA

Consider:

- The rules of thumb:
 - Engage early and widely
 - Work collaboratively
 - Be comprehensive
 - Take a digital approach
 - Update often
 - Share it and use it
- Other engagement that may be happening for the Local Development Plan. Could consultation activities be undertaken together?
- Who needs to scrutinise the SFRA
- The needs of the stakeholders and teams reviewing the SFRA
- The review timescales

USING

Task 9 Use the evidence in the SFRA

Your SFRA will help a planning authority make decisions about:

- the [local plan](#) or spatial development strategy
- individual planning applications
- how to adapt to climate change
- future flood management
- emergency planning (the resources needed to make development safe)
- the need or planned approach for the delivery of flood management infrastructure
- Local flood risk from all sources and catchment processes or cross-catchment boundary risk

The guidance below supplements the [SFRA Guidance](#) with good practice approaches that have been found through research and can be shared to support peer to peer learning.

9.1 Engage others to disseminate the SFRA	Good Practice: SFRAs are accessible and easy to update	Outcome: Outcome 6: Flood risk evidence base informs plans and policies
<p>It is good practice to disseminate the SFRA findings to departments within the local authority, other planning authorities, the Environment Agency, the lead local flood authorities, developers, neighbourhood planning bodies, emergency planners and the emergency services, local resilience forums and flood risk consultants.</p> <p>The dissemination should include information on how stakeholders can access the information easily, and the process to supply updated information to inform future updates to the SFRA.</p> <p>The SFRA should be easily located and accessible on the local planning authority website.</p> <p>Consider how to do this most effectively. This could include;</p> <ul style="list-style-type: none"> • Running a launch event • Promoting the SFRA on social media and on the council website • Training for internal and external stakeholders so that they are aware of the data, recommendations and how the SFRA should use and apply these. • Ensuring that local authority teams are aware of the mapping that can be used to inform plans and strategies, including infrastructure planning, parks and open space, development management, emergency planning. • Ensuring that other RMAs can use the findings to inform joint working on flood risk management matters. 		
<p>Key questions to consider:</p> <ul style="list-style-type: none"> ➤ Can the SFRA outputs be shared digitally and interactively? ➤ How will the SFRA be made accessible to others? ➤ What support is needed to do enable the outputs to be shared (e.g. IT/website support) ➤ Who needs to know about the SFRA to use it? ➤ How are they going to use it? What will they want to know? ➤ How will it be updated if feedback is received through the consultation? 		
9.2 Inform local plan	Good Practice: Using outputs to inform plans and strategies	Outcome: Outcome 6: Flood risk evidence base informs plans and policies
<p>The SFRA is part of the evidence base for the local plan or spatial development strategy.</p> <p>The local plan is at the heart of the planning system with a requirement set in law that planning decisions must be taken in line with the plan unless material considerations indicate otherwise. Plans set out a vision and a framework for the future development of the area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure – as well as a basis for conserving and enhancing the natural and historic environment, mitigating and adapting to climate change, and achieving well designed places. It is essential that plans are in place and kept up to date.</p> <p>The SFRA should be produced early in the local plan development so that the evidence can influence the location of future development and enable other opportunities.</p> <p>The SFRA will be used to do the sustainability appraisal of the local plan or spatial development strategy. The SFRA should be used to carry out the sequential test for the local plan or spatial development strategy, and to do the exception test, if land for development is proposed to be allocated in flood risk areas. In these cases the evidence in the SFRA will enable the local planning authority to establish if a development can be made safe without increasing flood risk elsewhere.</p> <p>As part of the local development plan, neighbourhood planning bodies will use the SFRA to develop neighbourhood plans. These consider whether neighbourhood planning areas may be appropriate for development.</p>		

The SFRA will be used by the inspector at the local plan examination, so the evidence needs to be robust and comprehensive to withstand this scrutiny and enable the local plan to be adopted.

Key questions to consider:

- Are all approaches used in the SFRA justifiable?
- Is there clear and evidenced decision making, and has this been endorsed throughout the process?
- Are specialist resources required to support examinations and hearings?

9.3 Inform wider plans and policies

Good Practice:

[Using outputs to inform plans and strategies](#)

Outcome:

[Outcome 6: Flood risk evidence base informs plans and policies](#)

Any recommendations of the SFRA about flood and water management in the local area should be applied by LPA officers and relevant risk management authorities to inform subsequent plans, policies and strategies that inform the way flooding is managed and sustainable communities are created. This includes findings and recommendations about climate change adaptation. For example, LLFAs are statutory consultees on development management for major applications (with surface water implications) and they should be consulted early if there are recommendations in the SFRA relating to sustainable drainage policies.

The [SFRA Guidance](#) online describes how others will use the SFRA, and should help to target any engagement activity.

The SFRA can be used by LPA officers and relevant risk management authorities to inform or update a range of other plans and strategies, including:

- Local flood risk management strategies
- Flood and Water Management Act Section 19 investigations
- Surface water management plans
- Drainage and wastewater management plans
- Shoreline management plans
- Catchment flood management plans
- Flood risk management plans
- Local, regional or catchment-level flood risk management strategies
- Individual flood risk management schemes
- Wider climate adaptation plans and strategies.

Through careful planning, activities to manage flood risk management may be incorporated into other strategic plans and projects to deliver benefits in other areas, such as improving health and wellbeing, local economy, skills and employment, reducing emissions and supporting biodiversity, informing local nature recovery strategies. Examples of such strategies/plans include:

- Infrastructure delivery plans
- Capital strategies
- Local transport plans (produced by county councils / unitary authorities)
- Local industrial strategies
- Local enterprise partnership strategic economic plans;
- Blue and green infrastructure/open space strategies
- Climate change strategies and action plans
- Viability assessments
- Planning obligation supplementary planning documents
- Statements of common ground (supporting the Duty to Cooperate in England)
- Design guides.

Various stakeholders and partners should be consulted to ensure they can use the SFRA to underpin their plans and policies.

Key questions to consider:

- Do the teams and organisations producing other technical supporting documents for the local plan and policies know about, and understand, the SFRA and how they could use it?
- How can the outputs and recommendations from the SFRA be effectively shared across teams and organisations who are producing associated plans and policies?

Good practice

This section provides descriptions and examples of the good practices found by Environment Agency research (2018-2019) that can help deliver the [SFRA Checklist](#).

The examples provided are not prescriptive or exhaustive of all cases available but intend to showcase possible approaches that could be considered or adapted further. It is worth noting national policy guidance does not encompass all issues and potential outputs associated with the SFRA process and local decision making and innovation is needed.

It should also be noted that where a project example has been identified as good practice for a particular approach, it should not be assumed that the whole SFRA or study is considered good practice in all respects. Over time, these cases may become out dated or replaced by new examples. These should be shared with existing networks, such as ADEPT or CIWEM to encourage peer to peer learning.

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1. Collaborative working

Understanding and managing the risk of flooding as part of a SFRA relies on successful collaboration, including: between LPA teams; with neighbouring LPAs within the same river catchment; with neighbouring LPAs across catchments; with other risk management authorities; and/or other interested parties such as local communities and neighbourhood planning groups or conservation and environmentally focused groups. This is described in the following sections.

Collaboration with other risk management authorities

The responsibilities for managing flood risk lies with a range of risk management authorities depending on the source of the flooding. The Environment Agency have a lead role in the management of flooding from main rivers, the sea and reservoirs, the LLFAs are responsible for co-ordinating the management of “ordinary” watercourses, surface water and groundwater, whilst water and sewerage companies are responsible for sewer flooding. In some parts of the country, internal drainage boards (IDBs) manage watercourses and land drainage networks. Owners of reservoirs, canals, infrastructure and land adjacent to watercourses, coastal groups, resilience forums and local communities may also have parts to play. The LPA should consult all these risk management authorities early and involve them in the SFRA development.

Collaboration between LPA teams

LPAs should consider which teams within their local authority need to be involved. Whilst SFRAs and other evidence base studies are often commissioned by spatial planning teams, successful SFRAs and the resulting implementation of decisions and policies will depend on the successful collaboration across teams. Teams involved will include those who will use the SFRA, those who may support its implementation (e.g. corporate GIS teams), and those who will feed into it. These teams will include development management, urban design, regeneration, estates, housing, economic development, infrastructure planning, emergency planning, highways, drainage, green space, flood risk management authority, GIS and data management.

Local authority teams that will be involved in producing and implementing the SFRA should be identified prior to commissioning that task so that they can be involved in the scoping of the study. This will also enable the stakeholders to identify the datasets and resources available for the study as well as any opportunities for joint working and the delivery of multiple benefits. Many of these teams could benefit from the evidence base provided by the SFRA, and may be able to contribute to the costs or resources needed to complete it. If the work required by other teams results in an extension of the scope of the SFRA, then the funding to pay for the work could be provided by them. If this is not identified and the cost factored in early enough then it can cause tensions internally or extra costs to the spatial planning team.

The SFRA data and information should be accessible to all internal stakeholders. Producing online mapping tools has been found to greatly improve the usability of the flood risk evidence base by all LPA teams.

Collaboration with other LPAs

Working with neighbouring LPAs can result in: better understanding of flood risk issues; sharing of resources; reduced costs for document or website production; improved opportunities for flood risk management; improved opportunities for establishing a consistent approach to flood risk management across the area.

The current NPPF and PPG in England reinforce the requirements attached to the legal ‘Duty to Cooperate’ in plan making. LPAs should now prepare Statements of Common Ground which form part of the evidence required to demonstrate that they have complied with the Duty to Cooperate and addressed cross boundary strategic planning and infrastructure issues (including flooding).

To identify an appropriate spatial scale for a SFRA and which LPAs to work with, the following issues may need to be considered: the severity of the local flood risk issues; the type and scale of the catchment; the scale and location of future development; involvement of relevant risk management authorities and availability of resources.

Producing an SFRA is often driven by the timeframe for local development documents and this is sometimes used as a justification for commissioning studies for individual LPAs. However, it is strongly recommended that joint studies are pursued where there is clearly a flood risk management advantage. Using online mapping tools to establish a live evidence base of flood risk datasets can greatly support the production of SFRAs across a group of LPAs that may be preparing Local Development Plans over differing timeframes. A live flood risk evidence base is much easier to keep up to date as new datasets become available and separate SFRA reports for each LPA can be prepared as and when they are needed. Producing online mapping tools in collaboration with other LPAs delivers cost and time savings for the LPAs involved.

Another common theme from the evidence was that addressing flood risk for spatial planning decisions was not a task restricted to the periodic production of a Local Development Plan and its strategic development allocations, it was a task encountered regularly. The climate change priority of LPAs and communities has seen flooding cited as one of the most frequent and well understood ways in which a changing climate is affecting people's homes and businesses. Addressing climate change required liaison with many partners and prior or ongoing collaboration by them on SFRAs provided a strong foundation for that climate change collaboration with resulting time and cost efficiencies.

LPAs often do not consider preparing joint SFRAs due to differing timetables for Local Development Plan preparation. However, the evidence suggests that the focus should be on working together to establish an online platform to display and view flood risk datasets which are much easier to keep up to date. This is further described in [Good Practice 6: Making SFRAs accessible for a wide audience and easy to update](#). Standalone SFRA reports for each LPA can be prepared as and when they are needed with reference to the online mapping.

Collaboration between LPAs when producing SFRAs drives consistency in assessing flood risk where it transcends LPA boundaries e.g. rivers and facilitates more effective catchment management.

Examples are provided below which have been assessed as “good practice” for collaborative working to produce an SFRA (Environment Agency research, 2021), and have links to where further information can be found.

Example: West London Boroughs Strategic Flood Risk Assessment

Description

A joint SFRA webpage for boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow.

Benefits

Collaborating enabled the Councils to share skillsets across the different authorities during the scoping and production of the SFRA; sharing of roles – flood risk manager from one Council, sustainable drainage systems (SuDS) expertise from another Council, Project Management from a third Council.

Collaborating between the six London Boroughs enabled successful data sharing and improved understanding of local flood risk.

Collaborating enabled a consistent approach for flood risk management where river catchments cross local authority boundaries.

Collaboration was led by one borough, providing leadership, a single point of contact, and a lead organisation to co-ordinate and delegate.

Considerable time and financial savings were made by commissioning and producing the SFRA collaboratively. Costs for the production and ongoing maintenance of the online webpage and web mapping are shared between the six Boroughs.

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Example: Cambridgeshire Flood and Water Supplementary Planning Document

Description

The Cambridgeshire SFRA was used to inform a Supplementary Planning Document (SPD) developed by Cambridgeshire County Council in partnership with the five LPAs within Cambridgeshire County and other stakeholders including the Middle Level Commissioners, Anglian Water and internal drainage boards. The SPD was adopted by all 5 LPAs in the county and it was endorsed by Cambridgeshire County Council in their role as LLFA to support the implementation of flood risk and water related policies in the Local Plans.

Anglian Water have since developed a Water Management Checklist to inform SFRAs that are being produced by LPAs, and supported by LLFAs, in their region.

Benefits

This provided the opportunity to understand cross-boundary issues and deliver consistency for future development across the county.

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Example: Gloucester City Council, Cheltenham Borough Council, Tewkesbury Borough Council 

Description

The Joint Core Strategy Consortium partnership between Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council led to the collaborative production of a Level 2 SFRA which considers flood risk from all sources.

Benefits

The collaborative consideration of new developments ensures sustainable development across all three council areas, tackling cross-boundary issues in a consistent approach.

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Example: Norfolk Strategic Flood Risk Assessment     

Description

A Level 1 SFRA for Norfolk area, comprising 4 reports for:

- 2017 Greater Norwich Area SFRA (Norwich City Council, Broadland District Council, South Norfolk Council and parts of Broads Authority administrative areas)
- 2017 North Norfolk SFRA (North Norfolk District Council, parts of Broads Authority)
- 2017 Great Yarmouth SFRA (Great Yarmouth Borough Council and parts of Broads Authority)
- 2018 King's Lynn and West Norfolk SFRA (Borough Council of King's Lynn and West Norfolk)

The Norfolk LPAs have a long track record of cooperation and are working together on strategic cross boundary planning issues, through the Norfolk Strategic Planning Framework. One of the aims of the framework is to inform the preparation of future local plans through shared objectives and strategic priorities and through shared evidence base.

The SFRA was led and co-ordinated by North Norfolk District Council through a steering group consisting of the LPAs and key stakeholders and adopted a consistent methodology over the region. The SFRA was prepared in conjunction with the following RMAs: the LLFA, Environment Agency, the Broads Authority, Anglian Water, Highways England and internal drainage boards.

Benefits

Working together with LPAs and other RMAs enables a consistent approach to flood risk management, sharing of datasets and information, sharing of expertise and local knowledge and an understanding of the wider cross boundary flood extents.

Reproduced with kind permission of North Norfolk District Council, Borough Council of King's Lynn and West Norfolk on behalf of the Norfolk Strategic Framework.

2. Considering flood risk at a strategic scale

The catchments of large and small watercourses often cross multiple local authority areas, as can groundwater aquifers and the flow paths of surface water and reservoir floodwater. Tides and currents operate across large ‘cells’ of coastline and in estuaries. Measures to alleviate flooding in one location may require consideration of development upstream or downstream in a neighbouring authority area. It is also worth noting that strategic sites of larger density may also span multiple catchments and, as with cumulative development, may influence peak flows through the catchment and downstream areas/authorities.

The spatial scale of flood risk studies should be informed by the source, pathway and receptors at risk of flooding. A range of scales needs to be considered, and in some cases, flood risk can most effectively be assessed and managed collectively at a scale that covers several local authority areas. This should be informed by existing local flood risk management strategies. These are particularly useful when they are up to date, have action plans, investment plans and identify where strategic solutions could be implemented. In coastal areas, the SFRA should be informed by the policies within shoreline management plans and marine management plans. It is important to note that policies may not be supported by investment, so LPAs should engage with coastal protection authorities to determine what information to include in the SFRA. This is particularly important for informing future land use and climate change modelling scenarios.

From a planning perspective, the mechanism to enshrine flood catchment scale initiatives should, in the first instance, be set out in the statements of common ground agreed with relevant adjoining authorities. Consultation with the Environment Agency and LLFA should also be front loaded in the plan making process and LPAs should not wait for the first formal consultation stage (held in accordance with Regulation 18 of the Town and Country Planning (Local Planning) Regulations 2012) to hold these strategic discussions.

Working together with neighbouring LPAs also provides the opportunity to have consistent flood risk planning policies, giving clarity to developers exploring planning proposals in multiple locations on the same flood catchment (refer to [Good Practice 1: Collaborative Working – Collaboration with other LPAs](#)).

Examples are provided below which have been assessed as “good practice” for applying a cross-boundary or catchment approach to producing an SFRA (Environment Agency research, 2021), and have links to where further information can be found.

Example: Applying a cross-boundary approach, Cambridgeshire County Council

Description

A significant amount of new development will occur in Cambridgeshire in the next 20 years and beyond. In order to reduce the impact upon the water environment, the LPAs recognised development needed to be appropriately located, well designed, managed and take account of the impacts of climate change.

The Cambridgeshire Flood and Water Supplementary Planning Document (SPD) was developed in November 2016 by Cambridgeshire County Council as the lead local flood authority (LLFA) in conjunction with five LPAs within Cambridgeshire (Cambridge City Council, South Cambridgeshire District Council, Fenland District Council, East Cambridgeshire District Council, and Huntingdonshire District Council), and other relevant stakeholders.

The SPD provides one document for the county which describes how flood risk and sustainable drainage systems (SuDS) should be managed and delivered through new development. It provides guidance on the implementation of flood and water related policies in each authority's respective local plans. This approach was taken in part because of the interconnected nature of the rivers and drainage network of the fens, whereby development in one location could increase flood risk in one or more other locations. It was also recognised that both the river catchment and sewer network (particularly urban areas) had insufficient capacity to accommodate more surface water runoff that could result from the scale of the proposed development. This was explored through the SFRA and prompted the adoption of a SuDS approach to manage surface water.



The SPD facilitates consistency across the river catchment on flood risk management policies and approaches by the LPAs. The SPD supports developers and consultants to identify, understand and achieve the expectations across the county more efficiently due to the consistent approach. As a result, the LLFA and LPAs are able to reduce the time spent on reviewing planning applications as submissions

should be of better quality.

Benefits

Using a cross-boundary approach provides a better understanding of the interconnected risk across multiple sources of flooding and across LPA areas. It helps identify more effective ways to manage and mitigate the flood risk whilst unlocking areas for development.

The consistent approach to flood risk policies and requirements for development management simplifies requirements for applicants, which enables them to avoid having to interpret multiple approaches for multiple locations. It also reduces time and costs for LPAs reviewing planning applications.

Source: Extract from Cambridgeshire Flood and Water Supplementary Planning Document

Reproduced with kind permission from Cambridgeshire County Council.

Example: Applying a catchment approach, Manchester City Council, Salford City Council and Trafford Council

Description

Within Greater Manchester there is an intricate and well-connected network of rivers, streams, sewers and canals. Issues of flooding associated with these different and interlinked sources of flooding require careful management across different risk management authorities and LPA areas. Actions to manage flood risk and water from new development need to be carefully considered so that they do not increase risk downstream.

The sub-regional SFRA for the Association of Greater Manchester Authorities recommended that there should be consistent flood risk policies and guidance across all AGMA councils to ensure that the forthcoming large-scale development and regeneration in the sub-region can occur in an efficient and sustainable way.

In order to provide a suitable assessment of flood risk in the area, a Level 1 and 2 Hybrid SFRA was prepared collaboratively by Manchester City Council, Salford City Council and Trafford Council and their contractors JBA in 2010.

Benefits

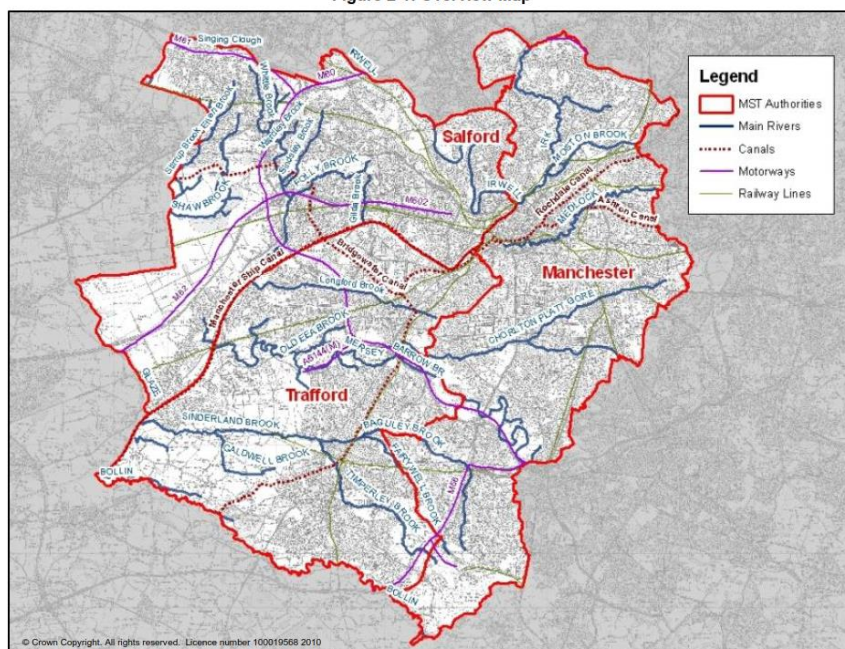
The catchment approach adopted by Manchester City Council, Salford City Council and Trafford Council and the associated risk management authorities when producing the SFRA led to a common understanding of the flooding issues across the catchments covered by the LPA areas.

A consistent approach to flood risk assessment and management was adopted across the catchment, which enabled the production of consistent flood risk policies and guidance.

Establishing working arrangements by catchment area during the production of the SFRA paved the way for successful partnership working when implementing the SFRA and tackling flood risk issues as they arose.

Consulting with the other LPAs and risk management authorities in this collective way saved time and therefore resource costs.

Figure 2-1: Overview Map



Source: Extract from Manchester, Salford and Trafford Level 1 SFRA, 2010

Reproduced with kind permission from Manchester City Council, Salford City Council and Trafford Council.

3. Putting appropriate governance in place for implementing the SFRA

Understanding flood risk, assessing it locally and then deciding how best to avoid, reduce, manage and mitigate those risks is often complex and involves multiple individuals and organisations. Decision making can be a significant process, considering the location and design of developments that will be sustainable, resilient and able to appropriately manage current and future flooding.

Good governance is needed to get the complex and often contradictory needs of stakeholders into a comprehensive scope. It is therefore essential that appropriate governance is in place to ensure that the findings from evidence base documents such as a SFRA are disseminated to appropriate teams, individuals or organisations so that other plans, initiatives and policies can be informed by them.

Approaches can include establishing a steering group for considering flood risk management or introducing it into the remit of an existing group or forum. The membership of the chosen group will need an appropriate breadth and level of representation to enable ownership of the SFRA outcomes and champion how that information then informs spatial planning decisions. In some cases, it may be effective to invite developers to participate, for example in relation to major growth proposals which they will have a key role in delivering.

Governance arrangements should be established in the scoping phase of a SFRA. The purpose of good governance is to ensure that the SFRA is produced based on evidence, to objectively assess development. This ensures the process is transparent and defensible prior to the results emerging, whatever they may be.

Establishing the governance arrangements early can minimise separate discussions with multiple internal departments and external stakeholders on how to inform spatial planning decisions. This can provide notable efficiencies for both time and budget resources. It also enables a more effective response to subsequent planning applications where flood risk and drainage are key considerations.

4. Comprehensive scoping of the SFRA

Careful scoping of a SFRA is a vital to make sure it is produced, updated and used effectively. A 'produce first, consult later' approach risks missing issues and opportunities that can be more challenging and expensive to incorporate later. Poor or out of date evidence bases can have a major impact on the LPA's ability to carry out its statutory planning functions, if the local plan is found to be unsound because of poor evidence, or if insufficient information is available to apply the sequential test. Proactive, informed leadership that co-ordinates the input of data and advice from flood risk management authorities can lead to comprehensive scopes that capture all the known flood issues and opportunities that can be explored during the production of the SFRA.

All flood risk management authorities should be consulted to identify all relevant issues and expectations, for example the need to undertake additional watercourse modelling, planned flood schemes that will change the level of flood risk, and particular catchment / coastline characteristics to consider, plus opportunities for flood mitigation or wider environmental benefits.

The same principle applies to other teams in the local authority. Engaging colleagues during the scoping exercise on issues such as infrastructure planning, management of green spaces, climate change response, emergency planning and development management enables buy-in from these teams and may identify synergies that can deliver cost and time efficiencies. Flood risk management authorities can support the LPAs by anticipating the future need for a SFRA, drawing together existing data and identifying issues requiring investigation that can be provided to the LPA early in the scoping phase.

Defining the scope of the evidence base is critical in ensuring it is fit for purpose. The purpose is linked to the objectives and which will be informed by consultation. The commissioning authority needs to fully scope out the objectives before they determine whether the evidence base is deemed fit for purpose. This ideally should be done before the budget is confirmed. A data gap analysis can be undertaken beforehand in a simplistic form and improved as the purpose and objectives are refined.

It has been found that the value of the flood risk information provided by a SFRA and associated tools extends beyond just informing a local plan and development allocations. It can be very helpful to informing each flood risk management authority's own work. As such they are encouraged to work collaboratively with the LPA on a shared flood risk management agenda.

Where flood risk expertise is not a key skill strength for the person leading the scoping and commissioning of a SFRA, it may be useful to invite an officer from one of the flood risk management authorities to be a partner, particularly from the Environment Agency or LLFA flood team. This expertise can help the LPA to interpret flood risk modelling, or shoreline management policies, FCERM scheme impacts on flood risk and what this means for the local plan and development proposals. This may depend on the capacity of the supporting organisations.

5. Taking account of specific local flooding characteristics

An SFRA should take account of the specific characteristics of the flood risks in the area and processes that can impact on flood risk.

In areas at increased risk of flooding and rapid surface water flooding the SFRA may recommend measures such as designing to capture key surface water flow paths and requiring surface water drainage systems to be designed to higher design standards in particular areas. These recommendations can then be incorporated by the LPA into its requirements for sustainable drainage systems (SuDS) and upstream storage management approaches/catchment based interventions to incrementally slow the flow of water.

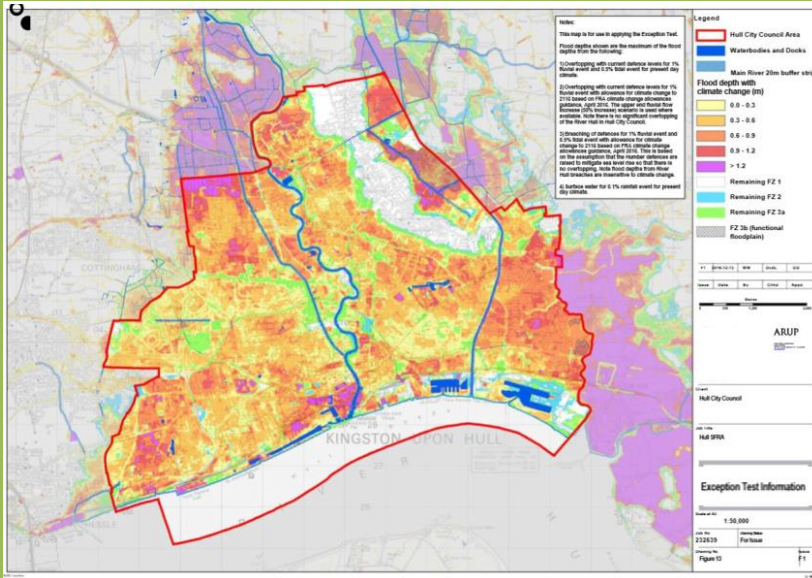
In a level 2 SFRA information such as flood extent, depth, velocity and in some cases rate of onset and duration, can be used to steer development to locations of lowest risk, should development in that location be deemed appropriate. This should also be used to consider appropriate building layouts, access-escape routes, density and provision of open space.

In areas that benefit from river and sea flood defences and associated infrastructure, residual risk of flooding needs to be safely managed through development design requirements and through the sequential test/approach. Water overtopping or breaching of flood defences can be treated as a separate source of flood risk (in comparison to assessing the risk of flooding in the absence of flood defences) due to the concentrated flow effect were a defence to fail. To fully demonstrate the flood risk (and particularly the residual flood risk) in areas such as these, the SFRA should consider the standard of protection that these defences provide, and the condition they are in, in order to identify any defences that are failing or with a short life expectancy, and prompt early conversations regarding the future improvement of these assets. The presence of defences should not be considered a means to enable new development. The existing risks need to be well understood and shown to be manageable and not increase the flood impacts.

It is good practice for the SFRA to consider wider catchment impacts of development, especially where these might fall out of the administrative area of the LPA. For example, the SFRA should consider development impacts on wider ecological networks and ensure that proposals do not adversely affect ecology or water quality. The SFRA should also consider if there are any upstream FCERM activities that provide benefit in the local plan area (for example pumping or land drainage activity reducing the risk downstream), and should be considered when assessing any residual risk.

Examples are provided below which have been assessed as “good practice” for taking into account local flooding characteristics in an SFRA (Environment Agency research, 2021), and have links to where further information can be found.

Example: Taking account of specific flooding characteristics: High risk and low lying, Hull City Council



Description

Hull is very low-lying and located within a large area defined as flood zone 3 for river and sea flood risk. There are very few areas of lower flood risk to steer development towards. Surface water is often unable to drain away into watercourses as the water level is higher than the surrounding land. The majority of the city is defended from these sources of flood risk by flood alleviation structures, such as engineered walls, embankments, water storage lagoons and pumping stations. The flood defences reduce the probability of flooding in much of the city but if a defence were to be breached or overtopped the consequences could be significant.

To mitigate this residual risk and ensure safe access, escape and evacuation should flood defences be overwhelmed, it was necessary to consider the requirement for a 'place of safety' as an integral part of new developments. Given the low-lying nature of Hull, this required a place of safety to be effectively integrated into all new developments (including permitted changes of use). The flood risk information produced in the SFRA (2016) provided the LPA and partners with the level of understanding needed to produce further tools to help manage the risk: local Flood Risk Standing Advice

Environment Agency: Local Flood Risk Standing Advice

Refer to SFRA Figure 13 for flood depth information

Consult the EA on all development within Flood Zone 3b (Functional Floodplain). In most cases, development should not be permitted.

Consult the EA on all development lying within 20m of the bank top of a Main River or 20m of the Humber Estuary (As shown on SFRA Figure 13)

Consult the LFA on all major developments

All development shall be provided with a place of safety at the level shown on SFRA Figure 15

Where relevant, the LPA must satisfy itself that the requirements of the Sequential Test and Exception Test have been met. See below guidance

Do not consult EA on any development lying solely within Flood Zone 1, unless any other consultation trigger is met on our Consultation Checklist

Development Category	Vulnerability Classification	Flood Depths >600mm	Flood Depths 300-600mm	Flood Depths <300mm & Remainder of FZ3	Flood Zone 2
1 Minor Development	All use classes	Mitigation Note 2	Mitigation Note 3	Mitigation Note 3	No consultation
	Essential Infrastructure	Consult EA with FRA Guidance for developers here	Consult EA with FRA Guidance for developers here	Consult EA with FRA Guidance for developers here	Consult EA with FRA
2 Change of use or Prior Approval resulting in	Highly Vulnerable (including basements dwellings)	Consult EA development should not be permitted	Consult EA development should not be permitted	Consult EA development should not be permitted	Consult EA with FRA
	More Vulnerable	Consult EA with FRA Guidance for developers here	Mitigation Note 1	Mitigation Note 2	FZ2 Note 1
	Less Vulnerable	Mitigation Note 3	Mitigation Note 4	Mitigation Note 5	FZ2 Note 2
	Water Compatible - development includes essential ancillary sleeping or residential accommodation	Consult EA with FRA	Mitigation Note 1	Mitigation Note 2	No Consultation
3 Operational Development	Other Water Compatible	Mitigation Note 3	Mitigation Note 4	Mitigation Note 5	No Consultation
	Essential Infrastructure	Consult EA with FRA Guidance for developers here	Consult EA with FRA Guidance for developers here	Consult EA with FRA Guidance for developers here	Consult EA with FRA
	Highly Vulnerable (including basements dwellings)	Consult EA development should not be permitted	Consult EA development should not be permitted	Consult EA development should not be permitted	Consult EA with FRA
	More Vulnerable	Consult EA with FRA Guidance for developers here	Mitigation Note 5	Mitigation Note 7	FZ2 Note 3
	Less Vulnerable	Mitigation Note 3	Mitigation Note 4	Mitigation Note 5	FZ2 Note 2
4 Water Compatible - development includes essential ancillary sleeping or residential accommodation	Water Compatible - development includes essential ancillary sleeping or residential accommodation	Consult EA with FRA	Mitigation Note 5	Mitigation Note 7	No Consultation
	Other Water Compatible	Mitigation Note 3	Mitigation Note 4	Mitigation Note 5	No consultation

and specific planning policies.

Working together, Hull City Council, East Riding of Yorkshire Council and the Environment Agency identified a bespoke approach to flood risk management was needed beyond national standing advice.

The local flood risk standing advice³ subsequently developed set out the requirements for the height of ground floor levels, flood resilience measures, and place of safety within the development / change of use based on the maximum modelled flood depths from river, sea and surface water flooding as well as the vulnerability of the proposed development / change of use.

The SFRA information also helped inform the development of a range of local plan policies to address the local flood risk issues, whilst enabling safe and sustainable development to proceed. The policies included: flood defences; surface water storage and drainage; sustainable drainage; addressing flood risk in planning applications; groundwater protection; green infrastructure and the green network, and; biodiversity (Local Plan Policies 37 – 41, 43 – 44).

Benefits

³ Strategic flood risk assessment | Hull City Council

The scope of the SFRA specifically took account of low-lying nature of the city and the associated local characteristics of river, sea, surface water and other sources of flood risk. The outputs of the SFRA were thus of sufficient detail and relevance to inform the production of local Flood Risk Standing Advice for Hull and robust policies to manage flood risk yet enable growth in new development and revitalise existing communities. That in turn provided clarity on the planning requirements for new development for both applicants and local authority development management officers, enabling applications to be processed more efficiently, saving time and money.

Reproduced with kind permission from Hull City Council.

6. Making SFRA accessible and easy to update

It is essential that SFRA are designed to be easily updated so they can be agile to changes in evidence, policy, legislation, climate change allowances, or wider circumstances. The Local Development Plan can often take years to adopt, which may mean the SFRA requires updating several times. Developing the SFRA as a ‘living document’, with online maps that can be easily updated to reflect new data or change in development sites, can help with this process. It should also be kept up to date after the local plan has been adopted as the SFRA will continue to be used for other purposes, such as assessing viability of windfall sites.

The SFRA scoping stage should determine triggers for when an SFRA update is required and factor in any future budget or data agreements that may be needed to support this. The online [SFRA Guidance](#) provides further information to support this process. As examples, datasets such as historic records of flooding will be updated when new flooding events occur and other datasets go through periodic revisions and updates. Also, guidance may change (e.g. guidance on climate change allowances) leading to new flood modelling and national mapping being produced, likewise local modelling may also be undertaken. Some of these datasets may be produced by the LPA, some may be produced by others.

To make this process efficient, good practice is to use online mapping systems to enable individual datasets to be updated when necessary via live web map services, without the need to commission a report update or reproduce hard copy maps. In this way, when the master dataset is updated, any other portals linking to that dataset will also automatically receive the update without any GIS layers needing to be transferred. Alternatively, the local plan team could lead one fully integrated web based spatial platform for all the local plan evidence which can then be adopted after consultation.

Using online mapping, rather than static hard copy maps in reports, can greatly improve the how accessible and usable the datasets are to LPA officers and the public. This also avoids problems in terms of making the data legible and at a useful scale, and avoids large file sizes that are inaccessible by the public on council websites. The quality and reliability of the data should be understood and presented where possible to help others when they use it to inform decisions.

A lot of the information to support the SFRA is GIS based and therefore amenable to displaying in online mapping portals. This also makes it easier to combine or overlap with other GIS datasets that are needed to make spatial planning decisions. It is important LPAs consider this in the scope of any mapping services that are to be procured.















Online mapping portals also provide a valuable tool for other departments within LPAs to use, thereby improving the consideration of flood risk issues by other teams within the LPA (refer also to [Good Practice 16: Using outputs to inform other plans and strategies](#)). Similarly, developers are more likely address flood risk from the outset in their designs if the information available to them and their design teams is easily accessible and simply presented.

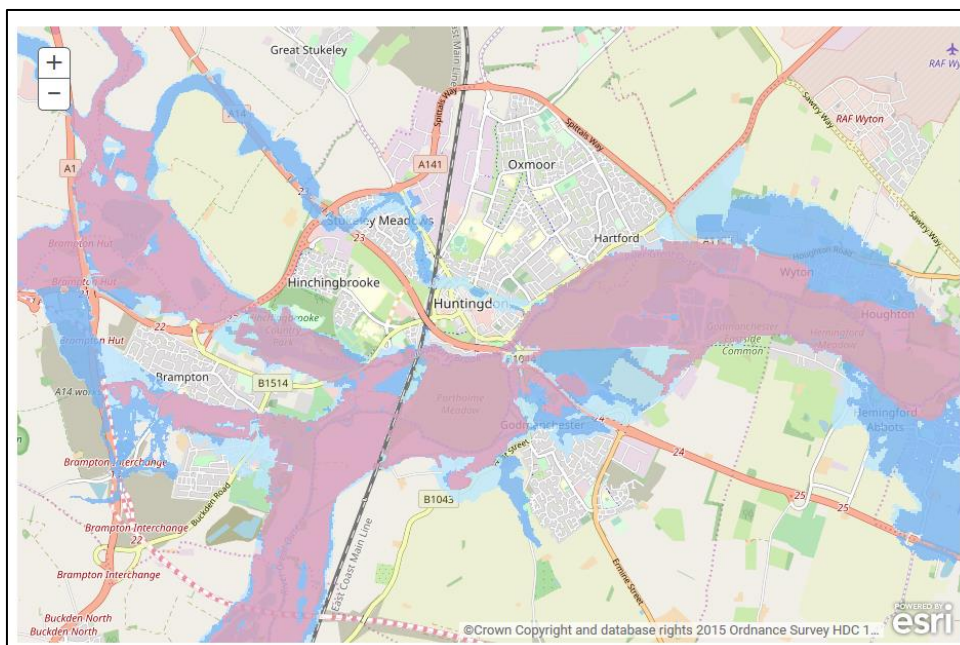
Examples are provided below which have been assessed as “good practice” for making the SFRA accessible and easy to update (Environment Agency research, 2021), and have links to where further information can be found.

Example: Making SFRA accessible and easy to update, Huntingdonshire District Council

Description

The SFRA produced for Huntingdonshire, first published in 2017, uses an online mapping portal rather than static hard copy mapping. Flood risk from a range of sources (river, surface water, groundwater) is collated together and can all be viewed in one place. The website includes a link to the report which explains all the information in the online mapping. The limitations of the data and appropriate use are clearly stated on the online mapping portal to make the users aware.

<input checked="" type="checkbox"/>	Flood Zones	 Flood Zone 2	 Flood Zone 3a	 Flood Zone 3b	
<input checked="" type="checkbox"/>	Climate Change Flood Risk	 Central	 Higher Central	 Upper End	
<input checked="" type="checkbox"/>	Updated Flood Map for Surface Water	 30 year extent	 100 year extent	 1,000 year extent	
<input checked="" type="checkbox"/>	Areas Susceptible to Ground Water Flooding	 $\geq 75\%$	 $\geq 50\% < 75\%$	 $\geq 25\% < 50\%$	 $< 25\%$
<input checked="" type="checkbox"/>	Flood Warning Coverage	 Flood warning area			



Source: Extract from the Huntingdonshire SFRA online mapping
[\(https://www.huntingdonshire.gov.uk/environmental-issues/flooding/strategic-flood-risk-assessment/\)](https://www.huntingdonshire.gov.uk/environmental-issues/flooding/strategic-flood-risk-assessment/)

Benefits

The online mapping portal has greatly improved the accessibility and usability of datasets by LPA officers and the public. That in turn has improved awareness of flood risk issues amongst the local community and developers.

Each dataset can be updated without the need to update the whole of the SFRA, ensuring that the SFRA can be kept up to date more easily and cost effectively.

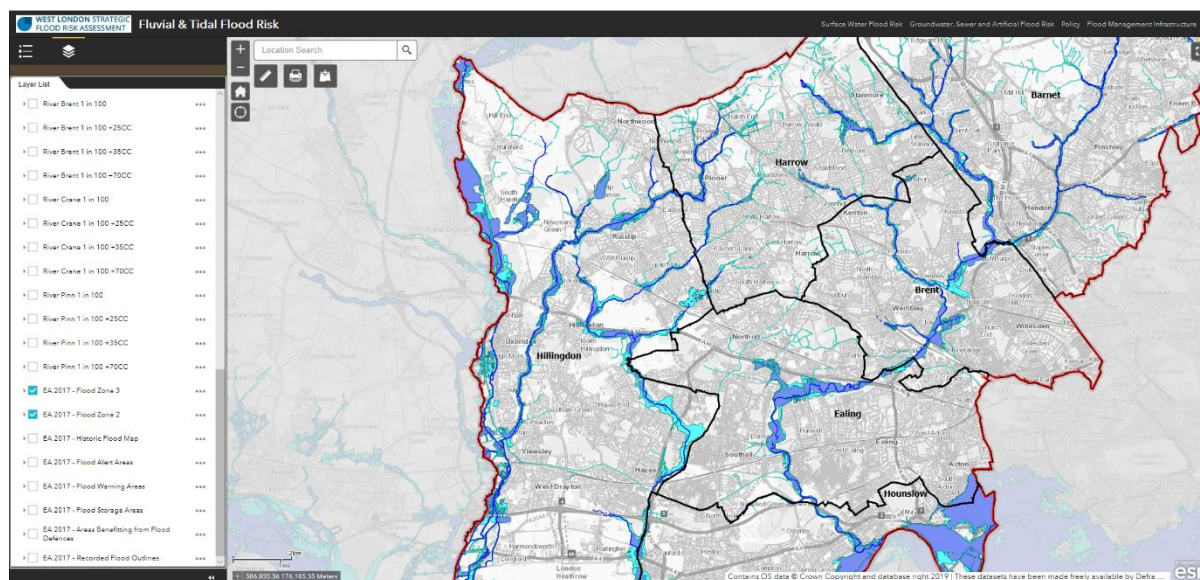
The mapping shows the data at the required resolutions, as opposed to hard copies which have maps inserted into them at only one resolution which may not be useful or at a legible scale.

Reproduced with kind permission from Huntingdonshire District Council.

Example: Making SFRA accessible and easy to update, West London Boroughs

Description

The West London Alliance collaboratively produced a SFRA in 2018 using an online mapping portal to report the risk of flooding across their six London Boroughs (Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow).



Extract from online mapping (<https://westlondonsfra.london/mapping-tool/>)

West London SFRA – Website User Guide

West London SFRA – Website User Guide

- The West London Strategic Flood Risk Assessment (SFRA) is available in an online website format only. The website is available for public view via the following weblink: <http://westlondonsfra.london/>.
- As a user with administrative rights, amendments to the SFRA's main contents and tables can be made. Amendments to the website's presentation, layout, graphics and accompanying pdf documents cannot be made.
- This document provides guidance on how to edit text on the SFRA website.

West London SFRA – Website User Guide



The portal collates all of the relevant flood risk datasets, as well as presenting maps relating to flood risk policy and development management considerations. Some of the datasets (flood map for planning, risk of flooding from surface water etc.) are accessed through live Web Map Service, which links to the government's data webpage so they will automatically update when the Environment Agency make changes.

The mapping enables the user to pan and zoom into the area of interest, whilst showing datasets at the appropriate resolutions for their use. The limitations of the data and appropriate use are clearly stated on the online mapping portal to make the users aware.

The SFRA features checklists which are tailored to the type of application for each user, with a very specific user guide. Moving to an online portal makes these much more obvious to the applicant; and hyperlinks are provided in suitable locations on the website.

Extract from website User Guide, with details for how to update sections of the SFRA.

A website User Guide is provided, describing how updates to the SFRA text can be made for those users with administrative rights.

Benefits

Using an online portal, whilst having an initial set up cost, significantly reduced the costs for future updates of the mapping. All Web Map Service datasets will update automatically, and other datasets can be added individually, as required, without the need to overhaul an entire report. This improved the quality and reliability

of the SFRA. An agreement with the consultants has been made to ensure the future maintenance and up keep of the website.

The SFRA deliverables are accessible to other teams within each of the LPAs, neighbouring authorities, other risk management authorities, developers and the public. This reduced the requests LPAs and the Environment Agency received for data and/or information, thereby delivering further cost and time savings. This also supported the role of each of the LPAs, which, as unitary authorities are also LLFAs.

Reproduced with kind permission from Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow London Borough Councils.

Example: Making SFRA accessible and easy to update, Northamptonshire County Council

Description

Northamptonshire County Council have developed an online flood toolkit which provides a platform for flood risk information across the county (<https://www.floodtoolkit.com/planning/developers/>). It contains the following sections:

- 'Am I at risk' – flood risk maps, weather warnings, flood investigations, mitigation studies
- 'It's an emergency' – what to do before, during and after a flood, reporting a flood, contact details for risk management authorities
- 'Who is responsible' – identifying who is responsible for what activities
- 'How to guide' – a library of advice and guidance documents related to flooding
- 'Planning and development' – general guidance on applying flood risk management in planning, guidance documents on:
 - Neighbourhood planning and flood risk
 - New development and emergency plans
 - Surface water drainage statutory consultation process and local standards
 - Guidance on groundwater flood risk
- 'Education' – Flood Aware pack designed to inform, educate and empower school children and build their understanding of flooding. Contains interactive scenarios and downloads.

Benefits

The toolkit provides a go-to place for everything related to local flood risk and it is easy to access. The pages are divided into end user groups (homeowner, landowner, business, etc.) which enables people to identify the information they seek quickly. This also allows guidance to be written with different audiences in mind i.e. with technical detail for developers and non-technical for public use.

Reproduced with kind permission from Northamptonshire County Council.

7. Assessing surface water flood risk

National policy makes clear that the risk of surface water flooding should be considered by LPAs when planning for strategic growth and allocating sites in their local plans (NPPF paras 159 to 162).

The frequency and severity of surface water flooding incidents are increasing as a result of changes in climate and land use. More frequent heavy rainfall events coupled with increased amounts of hard standing across built up areas are resulting in significant overland flow and surface water flooding. Surface water flooding is also more widespread in terms of *where* it can occur.

Surface water flooding is often combined with exceedance of the urban drainage network and public sewers. Growth and increased rainfall as a result of climate change are placing pressures on the capacity of the sewer network, reducing its ability to accommodate housing growth and increasing the risk of sewer flooding. A holistic approach to the management of surface water needs to be applied, working with the natural surface water catchment and employing sustainable drainage systems (SuDS). The NPPF expects all development in flood risk areas to include SuDS (NPPF para 167c). All major developments (NPPF para 169), including those lying outside flood risk areas, are also expected to include SuDS, with additional requirements applying to their maintenance, operation and provision of multifunctional benefits. If the local characteristics indicate locations where different types of SuDS could deliver the greatest benefits, or where they may be considered inappropriate (e.g. due to pollution risk), this could be included in the SFRA recommendations to provide greater clarity to developers. This could extend to recommendations for including a particular policy to be later transposed into local plans or neighbourhood plans, where there is evidence to support a particular approach.

Planning guidance, building regulations and British Standards use a hierarchical approach to discharge of surface water from new and re-development, starting with managing water at or close to the site. Discharging to sewers should be the last choice when all other options have been exhausted. The automatic right to connect does not prohibit the connection altogether, so local plan policies should stipulate (with the SFRA providing evidence to support) that connections to the sewer should consider capacity and downstream risk when determining a rate of connection.

When commissioning SFRAs LPAs should specify that recommendations are made for SuDS approaches based on local circumstances.

LPAs should identify areas at risk of surface water flooding and use this information to steer new development away from those areas through the application of the sequential test when screening sites for allocation. Some local plan policies may also require application of the sequential test where surface water risk is increased. The sequential test has historically only applied to fluvial flooding (Flood Zones 2 and 3) and emerging best practise is that surface water risk also be accounted for in the application of the sequential test. LPAs should consider what information already exists on surface water flood risk that could be used in planning decisions (for example, the Environment Agency Risk of Flooding from Surface Water maps or local authority modelling, surface water flood risk mapping in a surface water management plan or other data held by the LPA or LLFA, and information in local flood risk strategies). It may be the case that additional work needs to be completed to identify key 'at risk' areas and to assess the impact of climate change using climate change allowances for peak rainfall (Environment Agency [flood risk assessments: climate change allowances guidance](#)). The LPA will need to consider how the risk of surface water flooding compares with risk from sources of flooding in that LPA area and establish a framework for applying the test. LPAs may also want to account for combined sewer flooding with surface water as well as risk of flooding from non-main rivers in this process.

The approaches LPAs have taken to do this varies, based on the nature of the flood risk from different sources within their areas. Some examples of how surface water flooding has been assessed in SFRAs and used when applying the sequential test are provided in this section (also in [Good Practice 10: Applying the sequential approach based on all sources of flooding](#)). In some cases, it may be appropriate to use national or local surface water modelling and mapping to identify specific areas at

risk of surface water flooding, and to use these areas to inform future development. LPAs should ensure expert advice is sought from the LLFA on surface water flood risk.

As part of the SFRA process, any new approach to applying the sequential test to flood sources other than fluvial and tidal, needs to be clearly documented and justified. The LPA will need to describe how it should be applied to assess site allocations, as well as windfall sites.

Examples are provided below which have been assessed as “good practice” for assessing surface water flood risk in an SFRA (Environment Agency research, 2021), and have links to where further information can be found.

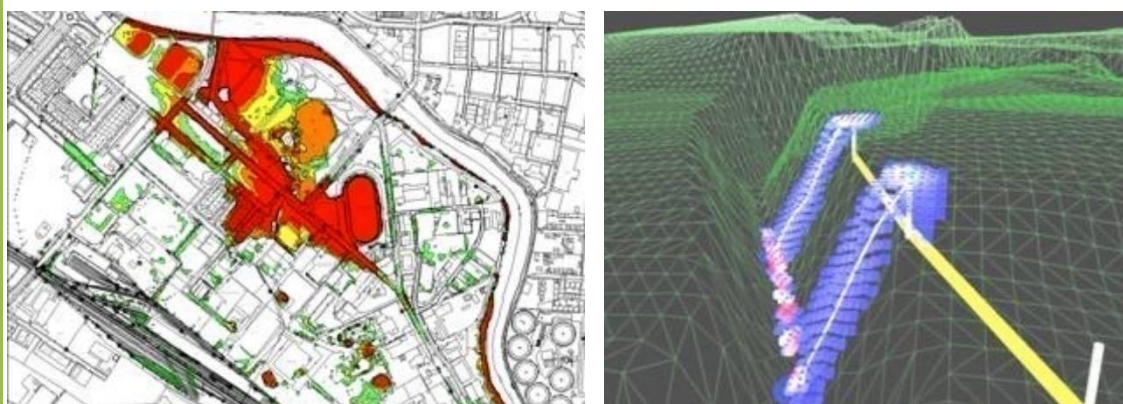
Example: Modelling combined sources of flooding, Glasgow City Council

Description

The Shawfield area of Glasgow forms part of the Clyde Gateway, and is a substantial area of regeneration. The area has suffered historically from various forms of flooding, including tidal/fluvial from the River Clyde, from culverted watercourses, surface water and the trunk sewer with numerous interactions between each of these sources through various pathways.

A strategic flood risk assessment (SFRA) and surface water management plan (SWMP) were produced in 2008/2009 by Glasgow City Council (on behalf of South Lanarkshire Council, Clyde Gateway and Scottish Enterprise). The SFRA included the development of a 2D Integrated Catchment Model (ICM) using Scottish Water’s network model and combined with Glasgow City Council’s culverted watercourse model. The model was run using a joint probability approach to assess the influence of the water levels in the Clyde on the ICM and a 2D surface water model.

The SFRA outputs enabled the flood risks to be more fully understood by the partners and stakeholders involved in the master planning and redevelopment of the area. It enabled flood risk management measures to be more effectively applied and the redevelopment potential of the area to be realised.



Benefits

Using integrated catchment modelling enabled an improved understanding of the flood risk in the area. The outputs influenced development master planning on multiple flood sources. The modelling was also used to undertake options assessment and identify flood risk management measures as part of new development.

Reproduced with kind permission from Glasgow City Council.

Example: Defining surface water flood risk zones, Brighton and Hove City Council

See: [Defining surface water flood risk zones, Brighton and Hove City Council in Good Practice 11](#)

Example: Defining surface water flood risk zones, West London Boroughs

Description

There is high risk of surface water flooding in the heavily urbanised boroughs across West London. In order to ensure this was considered through the spatial planning system, the SFRA for the six Boroughs (Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow) produced in 2018, established a new definition for areas at risk of surface water flooding.

Using the Environment Agency 'Risk of Flooding from Surface Water' (RoFSW) dataset, the outline for the 1% Annual Exceedance Probability (AEP) flood event was used to define areas of surface water flood risk which the West London LPAs describe as 'flood zone 3a (surface water)' and consider to be equivalent to flood zone 3 associated with the risk of flooding from rivers and the sea.

The LPAs have considered that establishing this definition enables surface water to be easily considered when applying the sequential test. The definition is also used to set clear criteria for when a site-specific FRA is required, and which organisation was responsible for reviewing it.



Source: West London SFRA (<https://westlondonsfra.london/>). Extract from Policy Map, July 2019.

Benefits

Identifying zones of surface water flood risk that are considered to be comparable to river flood risk enables a consistent approach to be applied to river and surface water flooding when applying the sequential test. In this way development can be steered towards areas at lowest risk of flooding from all sources.

Reproduced with kind permission from Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow London Borough Councils.

8. Assessing groundwater flood risk

National policy makes clear that the risk of groundwater flooding should be assessed in the SFRA.

Flooding from groundwater can happen when the level of water within underground rock or soil (known as the water table) rises above the land surface. This is caused by the amount and frequency of rainfall and its pathway into the ground. Flooding can also happen from groundwater rebound, where the water table rises back to its natural level once pumping for industrial purposes has ceased (e.g. in mines or extracting groundwater for manufacturing). Groundwater rebound can therefore occur in locations where underground water aquifers are absent. Rising groundwater can also infiltrate the sewer network, reducing its capacity to accommodate housing growth and increasing the risk of sewer flooding. It can also affect other types of infrastructure, both underground and on the surface. It is particularly important to consider the risk of groundwater flooding where basement/underground development is expected.

The groundwater datasets that can be used to inform SFRAs include:

- [British Geological Survey Groundwater Flooding Susceptibility Map](#)
- [Defra's Groundwater Emergence Map \(GEM\)](#)
- Groundwater Vulnerability Zones and Groundwater Source Protection Zones (SPZ)
- JBA Groundwater Flood Map
- London 'Increased Potential for Elevated Groundwater' (iPEG) maps (in London)
- Environment Agency's Areas Susceptible to Groundwater flooding map (currently only available to councils on request)

The ultimate aim is to identify the presence of risk. If groundwater does come out at surface then flooding and property flooding will occur. If groundwater comes to within 3m below surface then it can affect property structure or infrastructure. In places where there is known groundwater risk, the cumulative impact of development on the displacement of groundwater should be assessed in the SFRA. Any potential changes to current abstraction and pumping rules should also be assessed to understand the impact of any process or land use changes on groundwater flood risk.

The Joint West London SFRA (see [Good practice 7: Assessing surface water risk](#)) is one example that identified the risks to groundwater flooding and used the Environment Agency 2017 'Areas Susceptible to Groundwater Flooding' maps (1km resolution), GLA2011 'Increased Potential for Elevated Groundwater' (50m resolution, iPEG), and Environment Agency 2015 Source Protection Zones.

A recommended strategic policy is that "Boroughs should use their local plans to ensure developments with a high susceptibility to groundwater flooding demonstrate that increased groundwater mitigation and management measures have been implemented to protect people from groundwater flooding. Any known groundwater and flow routes should be safeguarded to ensure groundwater flood risk is not increased on site or elsewhere" (Metis Consultants, 2018).

At the site level, councils such as Camden, are requiring basement impact assessments (BIA) to be undertaken to demonstrate that groundwater levels are not raised significantly by basement development.

Developers who provide SuDS also required to provide evidence that infiltration SuDS do not increase groundwater levels and increase flood risk on or off site. Although generally SuDS are encouraged as a means of drainage they may not be appropriate in areas of groundwater flooding without careful planning and design. The requirement to screen for groundwater flood risk and SuDS may be included in SFRAs. The British Geological Survey provides [spatial data](#) on where SuDS are appropriate. Many local authorities (including Hampshire, Sutton and Croydon) are

informally asking for risk assessments to show that developments that include infiltration SuDS will not exacerbate groundwater flooding.

Currently there is little available national guidance on how groundwater flood risk should be considered, but the good practice example in this section illustrates a possible approach.

Examples are provided below which have been assessed as “good practice” for assessing groundwater flood risk in an SFRA (Environment Agency research, 2021), and have links to where further information can be found.

Example: Incorporating groundwater flood risk, Wiltshire County Council

Groundwater emergence (Figure 7.6)



Description

Flood risk in Wiltshire is complex due to the interaction between river, surface water and groundwater; the geology plays a significant role in the risk, as there is a mixture of clay, sand and gravel and chalk aquifers across the county.

Following a series of groundwater flooding incidents in 2013/14, Wiltshire County Council produced a Groundwater Management Strategy in

2016. The aim of the strategy was to “clarify the challenges caused by groundwater and how Wiltshire Council is aiming to identify areas at risk, and who can help in a partnership approach”.

The Council’s Groundwater Management Strategy sought to:

- Identify the level of detail required for site specific Flood Risk Assessments (FRAs).
- Give guidance on areas within Wiltshire susceptible to groundwater flooding.
- Determine the level of detail required when development is within groundwater areas.
- Outline methods for dealing with groundwater by resolving flow path and receptor routes.
- Give guidance and specifications for future development.
- Highlight the responsibility for groundwater flooding.
- Safeguard water quality where development is proposed within groundwater areas.
- Highlighting the key partnerships, with roles and responsibilities.

There is little available national guidance on how groundwater flood risk should be considered, though national policy makes it clear that the risk of groundwater flooding should be considered by LPAs when applying the sequential test.

The next iteration of the Wiltshire SFRA will identify areas of groundwater flooding and consider them equivalent to areas of flood zone 2 (associated with river flooding) to give a better indication of the interaction between groundwater and river flood risk. It will also include an assessment of sewer flooding and groundwater flood warning areas to influence allocation of all development. This will help ensure that the risk of groundwater flooding is incorporated into planning for strategic growth, applying the sequential approach, and allocating sites in local plans by the LPA.

The strategy highlights that where areas with a risk of groundwater flooding cannot, for other reasons, be avoided, the additional cost of developing mitigation which would include appropriate flood risk management infrastructure should be recognised in the plans.

Benefits

Identifying areas of groundwater flooding that are considered of comparable risk as areas of flood zone 2 (associated with river flooding) will enable a more transparent method for considering groundwater flood risk when applying the sequential approach and allocating sites in local plans.

The strategy identifies the need to recognise the costs for flood risk management infrastructure within future local plans and take the opportunities new strategic development affords to help reduce the risk of flooding from groundwater sources wherever feasible.

Reproduced with kind permission from Wiltshire County Council.

9. Assessing flood risk from artificial sources

National policy requires LPAs to consider the risk of flooding from all sources through the planning system, including the risk of flooding from reservoirs, canals and other artificial sources.

The likelihood of failure of a reservoir or other artificial source such as a canal is very low but has the potential to cause catastrophic damage due to the sudden release of large volumes of water. These residual risks need to be capable of being safely managed (also see [Good practice 15: safely managing residual risk](#)). The Toddbrook reservoir incident at Whaley Bridge in 2019 is a recent example of how this kind of risk can materialise and the report findings should be carefully considered by planning authorities (<https://www.gov.uk/government/publications/toddbrook-reservoir-incident-2019-independent-review>).

The planning practice guidance advises that LPAs consult with their emergency planning teams as early as possible where planning applications may have implications for emergency planning, such as sites located within an area at risk of reservoir failure. Where strategic issues affecting emergency services are identified in SFRAs, it may be relevant to contact the LRF which co-ordinates preparation for local incidents and catastrophic emergencies through its multi-agency flood plan.

When considering risk from reservoirs in the SFRA information and advice should be sought from emergency planners, the emergency services and local resilience forums. They can advise on the impact of proposed development on emergency planning and on the measures to include in development to avoid or minimise impacts on emergency planning. They will also use the information in the SFRA to understand the risk of flooding to existing and proposed development so they can plan for emergencies.

LPAs should also discuss any site allocations with reservoir owners to:

- avoid an intensification of development within areas at risk from reservoir failure, and;
- ensure they understand the cost and practical implications of any reservoir safety improvements required as a result of downstream development.

The LPA will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks and when considering development downstream of a reservoir, canal or other artificial source. In areas protected from the risk of flooding by defences, the risk of these breaching or overtopping may also be assessed as an artificial source of flooding, as the depths and velocities of flood water will be significantly different to those that would be encountered if the defences were not present in the first place.

LPAs will also need to evaluate:

- how an impounding reservoir will modify existing flood risk in the event of a flood in the river catchment it is located within; and
- whether emergency draw-down of the reservoir will add to the extent of flooding downstream.

The NPPF requires that where the operation of an existing business or community facility could have a significant adverse effect on new development in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed. This could reasonably include financial contributions to any necessary upgrades to reservoirs that are required as a consequence of the proposed downstream development. LPAs will need to ensure that relevant reservoir owners are consulted and given the opportunity to comment on the proposed allocations or developments.

Examples are provided below which have been assessed as "good practice" for considering reservoirs and artificial sources in SFRAs (Environment Agency research, 2021), and have links to where further information can be found.

Example: Considering risk from reservoirs in the Sequential Test, Hart District Council

Description

Order of Risk Ranking	Preference order
Flood Zone	1
UFMfSW	2
Access flooded	3
FMfSW	4
GW Flooding	5
AStGWF	6
Historic Records	7
Watercourse	8
Reservoir Flooding	9
Canal Embankment	10

Hart District Council prepared an addendum to their SFRA in 2017 to demonstrate that sites to be allocated for housing and employment development in areas of flood risk were appropriate in the context of the sequential test.

An extensive exercise was undertaken by the LPA to identify the risk of flooding to each site using the following datasets: reservoir flood risk maps, canal embankments within 100m, river flood zones, Updated Flood Map for Surface Water, Flood Map for Surface Water, Areas Susceptible to Groundwater Flooding, historic records, watercourse proximity. Part of the good practice was to ensure consideration of the flood risk to the site access as well as the site itself.

The sites were then ranked, in order of the risk of flooding. The ranking took account of the level of confidence in the dataset for each source and the likelihood of the type of flooding; for example, the order of ranking sites was based initially on the flood zone definition, as there is high confidence in the modelling that supports the flood zones. Because the SFRA and its addendum has explored the likelihood, extent and severity of flood risk from artificial sources the LPA was able to identify its level of risk relative to that from other flood sources. What had previously been unknown was now clear and that level of flood risk was able to be ranked and have a proportionate influence upon development decisions

Benefits

Using this approach, Hart District Council demonstrated that their sequential test process had considered all sources of flooding including the risks from artificial sources such as canals and reservoirs.

The methodology did not generate any new modelling or information but demonstrated how the existing available information had been applied to the application of the sequential approach in the District.

Reproduced with kind permission from Hart District Council and East Hants District Council.

Example: Assessing risk from canals and interlinked sources, Manchester City Council, Salford City Council and Trafford Council

Description

A SFRA was prepared collaboratively between Manchester City Council, Salford City Council and Trafford Council, with their contractors JBA, in 2010/2011. The SFRA provided an assessment of flood risk from all sources with a particularly detailed approach for those areas likely to experience significant development. For Salford this included an assessment of the risk from the Manchester Ship Canal and the Bridgewater Canal, as well as the River Irwell, surface water and groundwater.

Understanding the interactions between these different sources is fundamental to understanding the risk of flooding at a strategic level and recommending appropriate management measures. The SFRA has looked at the possible interactions between canals, reservoirs, rivers and surface water across Manchester, Salford and Trafford to prompt the appropriate consideration of these issues in site specific FRAs and further studies such as Surface Water Management Plans and Drainage Strategies.

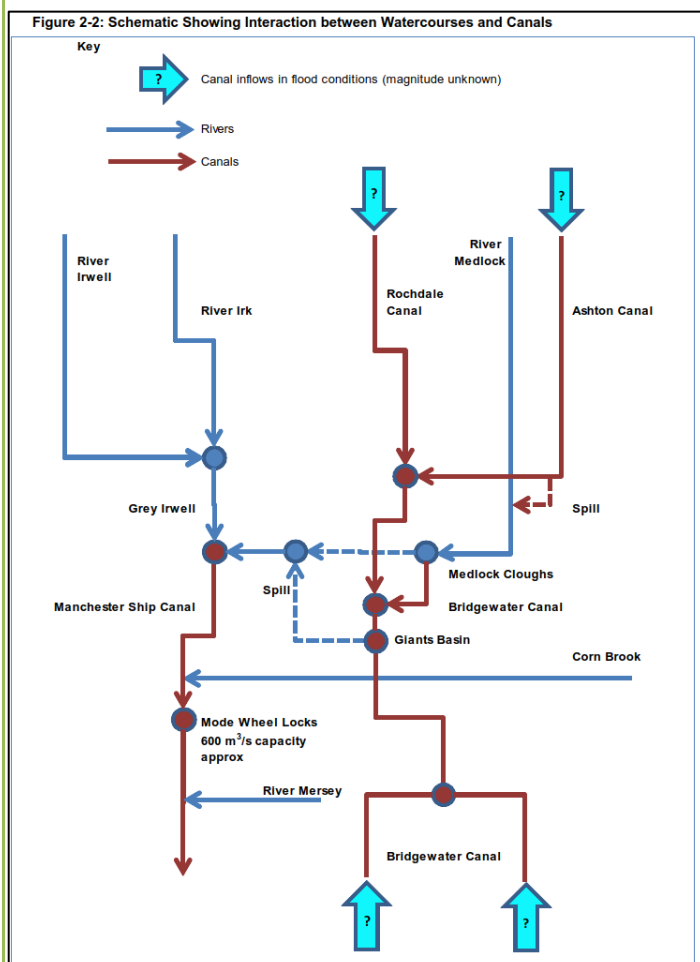
The effect of hydraulic interactions between different sources was considered. A desk-based study was undertaken, pooling available resources to try to define where these interactions may occur. At each location, potential risks were summarised, with the intention of providing a reference for flood risk managers, planners and developers in the future. Interactions were summarised in tables and mapped in the SFRA.

The SFRA assessed and identified areas at risk of flooding due to interactions between the canals, reservoirs, rivers and surface water. These interactions are summarised in tables and mapped in the SFRA. The benefit of

Benefits

having this information is that it can be used to inform strategic planning decisions and the application of the sequential approach. Development can be avoided in areas identified at high risk from these interlinked sources and these areas can be targeted for specific flood risk management measures.

Reproduced with kind permission from Manchester City Council, Salford City Council and Trafford Council.



10. Applying the sequential approach based on all sources of flooding

National policy and guidance states that when applying the sequential test as part of a local plan, LPAs should consider all sources of flooding and the current and future impacts of climate change. The national data and maps show the flood risk for each flood source in isolation so the information in a SFRA should be used to inform an integrated approach to apply the sequential approach to spatial planning decisions based on all sources of flood risk.

There is no specified approach in existing guidance of how to do this, and it is therefore for the LPA undertaking the process to decide. This is often difficult to undertake because there is considerable variation between the different sources of flooding risk in terms of:

- the **impact of the flooding** from each source (for example, the risks from reservoir flooding and surface water flooding are different in terms of likelihood and resulting flood depths and damage);
- the **perceived ease with which each source can be managed** (for example, there is a perception amongst practitioners that flooding from surface water or groundwater is easier to manage and therefore doesn't need so much weight given to it during site selection and strategic planning); and,
- the **reliability of the data used to assess the risk** (for example, hydraulic modelling undertaken to determine the risk of river and sea flooding is more detailed and reliable than national or regional scale mapping of groundwater flood risk based on a high level understanding of geology).

As a result of these variations it is difficult to draw parallels between the different sources of flooding and establish what is considered 'equivalent' in terms of risk. In some cases, LPAs have been able to define what level of flood risk from ordinary watercourses, surface water, or groundwater they consider to be equal in their local area to the risk of flooding from main rivers or the sea which is defined by flood zones. Many SFRA use a 'Red, Amber, Green' (RAG) scoring approach to determine individual sources of flood risk and also to look at these collectively. Any 'wider sustainable development objectives' that a site in an area of increased flood risk may deliver should be established at this point.

It is up to the LPA to determine whether or not the sequential test has been passed in order for a site to be allocated, but the role of the SFRA is critical. It is important for the SFRA to be clear and rigorous as it sets an example for future developments coming forward.

Through the Level 2 SFRA site screening process, the LLFA should advise on prospective allocations in areas at risk of flooding.

Examples of this approach being applied for West London Boroughs SFRA and Wiltshire Groundwater Management Strategy have been described in [Good Practice 7: Assessing surface water flood risk](#) and [Good Practice 8: Assessing groundwater flood risk](#).

Some further examples have been included in this section (found in Environment Agency research, 2021), which show several similar approaches, whereby the risk from all sources is considered collectively and used to rank potential allocation sites to inform the sequential approach.

Example: Applying the sequential approach based on all sources of flooding, Waverley Borough Council

Description

As part of their Level 2 SFRA, Waverley Borough Council established some 'Flood Risk Categories by Flood Type' to enable potential development sites to be compared on flood risk terms, considering the risk from rivers, surface water and reservoir flooding.

These categories were used in combination with a defined 'Flood Risk Suitability Assessment Criteria' to enable the ranking of potential allocation sites based on flood risk from rivers, surface water and artificial sources and thereby the application of the sequential test.

One of the chief deliverables for the updated Level 1 SFRA was a Site Assessment Database, which provided flood risk statistics for all of the potential development sites identified by the council using the datasets in the SFRA. This was used to inform the 'flood risk suitability assessment criteria' and to rank the sites.

Table 5-1 Flood Risk Categories by Flood Type

	Very high	High	Medium	Low
Fluvial (Flood Zones (FZ))	>35% in FZ3b	>35% in FZ3a	>50% in FZ2	>50% in FZ1
Fluvial (Detailed Modelling)	>35% at risk of 1 in 20yr RP event	>35% at risk of 1 in 20yr RP event	>50% at risk of 1 in 100yr RP event	>50% not at risk from 1 in 100yr RP event or greater
Surface Water/Sewer	>50% at risk of 1 in 30yr RP event	>50% at risk of 1 in 100yr RP event	>50% at risk of 1 in 1000yr RP event	>50% not at risk from 1 in 1000yr RP event or greater
Artificial Sources	>75% max reservoir or canal outline	50%<>75% max reservoir or canal outline	25%<>50% max reservoir or canal outline	<25% max reservoir or canal outline

Figure 5-1: Flood Risk Suitability Assessment Criteria

Score	Criteria
1	Flood Zone 3b or equivalent* in over 50% of the site
2	Flood Zone 3 or equivalent* in over 35% of the site or: Medium or high risk of surface water flooding <u>and</u> reservoir flooding in the majority of the site.
3	Flood Zone 3 or equivalent* in any part of the site or: Medium risk of flooding from any source
4	Over 50% of the site is at low risk of flooding from all sources
5	100% of the site is entirely at low risk of flooding from all sources

*where Flood Zone information has been superseded by detailed flood modelling, flood model outlines are used.

Benefits

The flood risk suitability assessment criteria allowed all of the sites to be ranked based on all sources of flood risk, making it a transparent consideration of sites. The provision of the raw data in a usable format to the council enabled them to apply the sequential test and consider the risks to all sites collectively.

Applying this approach, the council was able to demonstrate a robust application of the sequential test that considered the risk of flooding from a range of flood sources, ensuring that development was steered away from areas with high flood risk from any source not just rivers.

Reproduced with kind permission from Waverley Borough Council.

Example: Sequential Test applied in an integrated way to all flood sources, East Riding of Yorkshire Council

Description

East Riding of Yorkshire Council have developed a Flood Risk Note for the Planning Application Process. The purpose of the document was to assist developers, applicants and local planning authority officers on how to use the council's Strategic Flood Risk Assessment and how to apply flood risk policy in the East Riding of Yorkshire. It aimed to promote transparency and consistency in the approach East Riding of Yorkshire Council will take to applying the flood risk sequential test and exception test.

The note was initially prepared in 2010, updated in 2017 to reflect the adoption of the East Riding Local Plan and to incorporate best practice, and updated in 2018 to reflect updated Sustainability Appraisal objectives.

The document provides some useful criteria on identifying the risk of flooding from other sources, as part of a site-specific FRA, showing an awareness that the data and mapping about these sources of flooding is often high level and of lower confidence. Para 1.12 states:

Because the methods used to assess these 'other' sources of flooding in the SFRA are relatively 'broad brush', it is not intended that the areas identified should be interpreted as a definitive representation of surface water / groundwater risk zones. Rather, the SFRA recommends that these should be investigated further through a site-specific FRA (Step 6). The Council may consider there to be a surface water / groundwater risk if it is found that the site meets any of the following criteria:

- the site's average gradient is greater than 1% (1 in 100), as this is likely to generate overland flow;
- there is a ditch(es) adjacent to the site;
- the groundwater level is high (e.g. likely to impede the natural storage soakage of rainwater);
- there is a large impervious area next to the site (e.g. more than 50% of an adjacent site is impervious, using a 50m band width from all boundaries of the site); or,
- there is a history of surface water and/or groundwater flooding on the site (e.g. in June 2007).

Furthermore, Table 3 in the Flood Risk Note sets out 'ranked levels of flood risk' which demonstrates how the council consider that the risk of flooding from all sources should be incorporated into the application of the sequential test.

Table 3: Ranked levels of flood risk

Flood Risk Levels	Rankings (1=lowest & 18=highest)
Zone 1 Low Probability	1
Zone 2 Medium Probability	2
Zone 1 Low Probability + Other Sources	3
Zone 2 Medium Probability + Other Sources	4
Zone 3a High Probability - Fluvially Dominated	5=
Zone 3a High Probability - Tidally Dominated 12+ hours warning	5=
Zone 3a High Probability - Fluvially Dominated + Other Sources	6=
Zone 3a High Probability - Tidally Dominated 12+ hours warning + Other Sources	6=
Zone 3a High Probability - Tidally Dominated 6-12 hours warning	7
Zone 3a High Probability - Tidally Dominated 6-12 hours warning + Other Sources	8
Zone 3a High Probability - Tidally Dominated Less than 6 hours warning	9
Zone 3a High Probability - Tidally Dominated Less than 6 hours warning + Other Sources	10
Zone 3a High Probability - Tidally Dominated Danger to Some	11
Zone 3a High Probability - Tidally Dominated Danger to Some + Other Sources	12
Zone 3a High Probability - Tidally Dominated Danger to Most	13
Zone 3a High Probability - Tidally Dominated Danger to Most + Other Sources	14
Zone 3a High Probability - Tidally Dominated Danger to All	15
Zone 3a High Probability - Tidally Dominated Danger to All + Other Sources	16
Zone 3b Functional floodplain	17
Zone 3b Functional floodplain + Other Sources	18

Note: This Table represents the Council's interpretation of how sites should be ranked using the SFRA flood zones and taking into account risks from 'other' sources of flooding, in order to identify sequentially preferable sites for the Sequential Test process. It is highlighted that the SFRA does not assess flood hazard in Fluvially Dominated Zone 3a, therefore for sites located near to flood defences in this zone (e.g. parts of Beverley and Stamford Bridge) the site-specific Flood Risk Assessment will need to calculate the flood hazard¹⁶ of defence failure, and rank the risk level accordingly (e.g. on parity with Tidally Dominated Zone 3a rankings 11-16).

Source: Extract from East Riding of Yorkshire Council Flood Risk Note for the Planning Application Process, (2018).

Benefits

The approach enabled the council to demonstrate a robust application of the sequential test that considered the risk of flooding from a range of flood sources, ensuring that development was steered away from areas with high flood risk from any source not just rivers. There was an appreciation within the methodology that the data and information to understand the risk from some of the 'other sources' of flooding (e.g. groundwater and artificial sources) are less reliable than data for rivers, sea or surface water. To address this, the Flood Risk Note highlighted the need to consider following up with a site-specific flood risk assessment that investigates flood risk in more detail.

Reproduced with kind permission from East Riding of Yorkshire Council.

Example: Applying the sequential approach based on all flood sources, Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council

Description

The Joint Core Strategy Consortium partnership between Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council worked together to assess local housing and employment needs. This collaborative approach ensured sustainable development across all three council areas, tackling cross-boundary issues in a consistent approach.

As part of the evidence base for the Joint Core Strategy, the three LPAs collaborated to commission and produce a Level 2 Strategic Flood Risk Assessment which was published in 2011. The SFRA considered flood risk from all sources across the study area, and how new development could impact upon the current level of flood risk in the area.

Section 3 of the SFRA assigned each site a suitability ranking, as shown below:

Scoring Code	Criteria Definition
1	Site is mainly in Flood Zone 3b
2	Site is mainly in Flood Zone 3a
3	Site is mainly in Flood Zone 2
4	Site is mainly in Flood Zone 1 but affected by Flood Zones 2, 3a and 3b
5	Site is fully in Flood Zone 1

The risk from flood sources other than rivers and sea, residual risk and historical flooding was also incorporated into the suitability assessment. Where any of these risks are present, the scoring code was reduced, commensurate with the level of risk.

Combining flood risk from all sources into ranking criteria provided a more holistic assessment of the risk. Using these scores in conjunction with other planning considerations made it a more sustainable approach for allocating new developments.

Benefits

Using set criteria to establish a suitability ranking of the site enabled a transparent process for the consideration of sites and the application of the sequential approach. It also enables the LPAs to consider the merits and constraints of the sites in relation to flood risk in conjunction with the other planning considerations that they have to weigh up.

Reproduced with kind permission from Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council.

11. Assessing and managing the cumulative impact of development on flood risk

Whilst an individual development may have a minimal impact on flood risk, the cumulative impact of many such developments on the same river or surface water catchment can be significant.

National policy requires LPAs to consider cumulative impacts in, or affecting, local areas susceptible to flooding. This should include the impact expected from strategically planned development as well as the cumulative impacts of development, permitted development such as paving over domestic gardens and building extensions, and significant changes in land use, such as woodland and forest planting or felling, habitat creation, and changes to farming practices. Whilst these may be difficult to quantify exactly, various scenarios could be estimated and used in assessments.

It is important to consider the expected impacts of these changes as they have the potential to significantly alter the frequency and/or severity of flooding. As a minimum new development should ensure there is no increase in surface water runoff, and where possible provide betterment, but over time, the cumulative impact of developments increasing areas of hard surfacing, can alter surface water flow paths and drainage patterns and reduce the capacity of a river's floodplain to store floodwater.

Changes to existing development too can increase vulnerability to flooding plus the risk of flooding to new development. For example, the widespread paving over of gardens can increase the risk of surface water and sewer flood risk, reducing the suitability of the local areas for new development. These changes can be small on individual development scale, but over time could lead to bigger impacts.

An SFRA should identify areas with limited capacity to manage increases in any source of flooding, particularly rivers and ordinary watercourse, surface water and sewer, and assess the consequences of locating new development in those flood / sewer catchments and likewise for any anticipated significant changes to existing development. There are tools and guidance to help LPAs and others undertake simple tests to determine how sensitive their area is to changes in runoff (for example to simulate urban creep) (<https://www.gov.uk/government/publications/improving-surface-water-flood-mapping-using-local-drainage-rates>). This can help inform whether further modelling is required. Over time, the risk modelling should be updated periodically to include any changes in risk, and be used to update the SFRA so that the most up to date evidence is used to assess windfall sites.

Where increases in flood risk are identified the LPA should consider measures that could be put in place to reduce and/or manage this cumulative impact. Reference to strong policies on SuDS, green infrastructure, reducing the footprints of built development in flood risk areas, or the removal of permitted development rights in sensitive areas could assist this process. This approach is supported by the NPPF which states local plans should use opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management).

Examples are provided below which have been assessed as “good practice” for considering cumulative risk in SFRAs (Environment Agency research, 2021), and have links to where further information can be found.

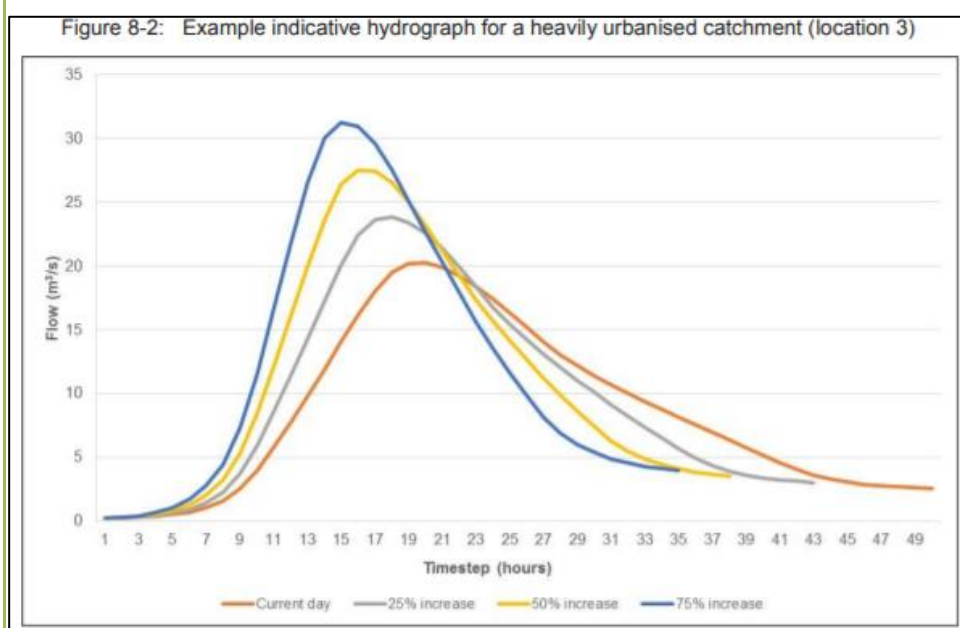
Example: Assessing the cumulative impact of development across a river catchment, Leicestershire County Council and Leicester City Council

Description

Leicestershire County Council and Leicester City Council produced a SFRA in 2017 to consider likely flood risk from all sources of flooding in the area, to inform strategic growth options. This SFRA was produced collaboratively across nine LPAs, adopting a catchment-wide approach to tackling flood risk.

The SFRA includes an assessment of the cumulative impact of development, considering the potential impact of increasing impermeable surfaces on surface water flooding and runoff into watercourses downstream.

Section 8 of the SFRA describes the impact of the modelled increase in urban extent (should no sustainable drainage systems be implemented) and the loss of floodplain storage. It used three different scenarios to model against the baseline: 10%, 25% and 30% increase in urban extent within the catchment. Using rainfall modelling, indicative hydrographs were created to show the effects of a 1% AEP flood event. The results show that watercourses are sensitive to an increase in the impermeable area because of development and change of land use.



Source: Extract from Leicestershire and Leicester City Level 1 SFRA – showing the impact of increased urban extent on flows in an urban catchment.

This assessment highlighted that although the increase in runoff from individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments could be severe. New development and associated landscaping have the potential to significantly alter surface water flow paths and drainage patterns, as well as alter the capacity of a river floodplain to store floodwater. Appropriate mitigation measures such as SuDS were recommended as a key method to reducing impacts of development on the flow regime of receiving watercourses and flood risk in the catchment. This was particularly important where urban areas in the downstream catchment were already prone to flooding.

Benefits

This type of modelling provided a robust evidence base for the council to justify more stringent policies on SuDS. It provided developers and decision makers with transparency on the scale of current flood risk and how that could be exacerbated by the scale of proposed development and facilitated a strategic approach that was more time and cost efficient than addressing flood risk on a case by case basis.

Reproduced with kind permission from Leicestershire County Council and Leicester City Council.

Example: Managing cumulative impact of development on fluvial, surface water and groundwater flood risk, Hart District Council

Description

The SFRA for Hart District Council, produced in 2016, identifies that for flood risk management measures to have the greatest benefit, they should not only target the most at-risk locations but should also apply a catchment-based approach and consider the surface water catchment upstream of these high-risk areas. Within their SFRA, the council identified surface water catchments (within which there are surface water flooding issues) as 'Causal Areas', from where surface water flooding originates.

The council undertook a GIS based analysis of the number of properties identified to be at risk of flooding based on the Flood Map for Surface Water, the Flood Map for Planning and the susceptibility to groundwater datasets. Using this information, the council ranked the urban areas by flood risk for each source. The ranking was used to identify where most of the risk is concentrated and hence which surface water catchments are most important to manage runoff from.

Four Causal Areas were identified by delineating the surface water catchment areas upstream of the top four at risk urban settlements.

In these Causal Areas the SFRA made the following recommendations:



"It is recommended that stricter management of surface water runoff is applied in these four Causal Areas as these areas will have the greatest impact on fluvial and surface water flood risk in Hart. This could include mitigation such as: all parking areas and hard surfacing (with the exception of the public highway) using permeable surfacing unless shown to be technically unviable. All brownfield development should be looking to provide a reduction in surface water runoff below existing levels. Minor new builds should be providing surface water storage and ensuring discharged rates are no higher than existing or where this is not possible due to blockage issues discharging at rates no higher than 5 l/s. All major developments are to incorporate a wide range of SuDS and demonstrate that they are fully compliant with the National SuDS Standards and latest climate change advice".

Benefits

The identification of Causal Areas enabled Hart District to pin point those areas where there was potential for multiple developments to cumulatively exacerbate flooding further down the catchment.

It also provided an invaluable tool for tackling the cumulative impact of development on flood risk, enabling stricter requirements of the management of surface water to be applied on new development within these 'contributing' areas.

Reproduced with kind permission from Hart District Council and East Hants District Council.

Example: Assessing and managing the cumulative impact of development on surface water flood risk - Defining 'Conveyance' and 'Accumulation' zones, Brighton and Hove City Council  

Description

Surface Water Flood Zones were introduced to the Brighton and Hove SFRA to define areas potentially at risk from surface water flooding and supported the preparation of the City Plan Part 2 (the draft Plan was published 2018). The aim of this was to provide for more strategic consideration of surface water flood risk in the land allocation and planning process and secure appropriate commitments that development would be safe for its intended lifetime and not have an adverse effect on third parties.

The urban land use, steep topography and lack of watercourses in Brighton and Hove make it particularly susceptible to surface water flooding. The Risk of Flooding from Surface Water mapping shows surface water risk is prevalent across Brighton and Hove, affecting 2.4 square kilometres of area during a 1% Annual Exceedance Probability event. Recorded incidents of actual surface water flooding show clusters of events in the Preston Park, Patcham and Portslade areas.



For the purpose of establishing Surface Water Flood Zones the relative level of risk for high, medium and low probability events was not easily defined, primarily due to the fragmentation of responsibility for management, the differing standards used to design and maintain assets and the complexity of the mechanisms involved. It thus became a necessity to identify the areas that were potentially at risk and to understand the parties responsible for managing the risk. Accordingly, a simpler approach was taken based on the identification of surface water: 'Accumulation Areas' and 'Conveyance Areas' that describe the areas potentially at risk. The following two zones were defined:

Surface Water Flood Zone a: Accumulation Zone – where runoff can be expected to pond.

- SWFZa is defined as land affected by a high probability event (1% AEP) and here runoff can be expected to pond. This event was selected to be representative of the flood risk areas in Brighton and Hove, have a reasonable chance of occurrence and to be consistent with the level of risk used for river flood zones.
- Development of basement dwellings is not normally permitted in SWFZa.
- For all other development, a flood risk assessment (FRA) is required to demonstrate that the proposal will be safe from surface water flooding for its lifetime and does not increase flood risk elsewhere. FRA requirements include:
 - Assessment of flood risk from all sources.
 - Consideration of surface water flow pathways across the site during a flood event of 1% AEP plus 30% uplift for climate change and how the proposed development may alter these. Overland flow modelling may be required to demonstrate this.
 - Demonstration that ground floor levels should be a minimum of whichever is higher of: 300 mm above the general ground level of the site; or 600mm above the estimated surface water level in the 1% AEP event with drainage plus 30% uplift to account for climate change.
 - Consideration of other surface water flood resilience measures.

Surface Water Flood Zone b: Conveyance Zone – locations where the interruption or changing of flow direction could affect flood risk.

- The extent of SWFZb was based on the speed and depth with which surface water can flow over the ground surface and was to identify locations where the interruption or changing of flow direction could affect flood risk. It was defined by ground that has a gradient steeper than 1 in 20 (5%).
- All types of development could be appropriate for this zone, providing an FRA could demonstrate it would be safe from flooding for its lifetime, and not increase flooding elsewhere. FRA requirements include:
 - Assessment of flood risk from all sources.
 - Consideration of surface water flow pathways across the site during a flood event of 1% AEP plus 30% uplift for climate change and how the proposed development may alter these. Overland flow modelling may be required to demonstrate this.
 - Consideration of surface water flood resilience measures.

Example: Assessing and managing the cumulative impact of development on surface water flood risk - Defining 'Conveyance' and 'Accumulation' zones, Brighton and Hove City Council  

Benefits

Identification of these surface water zones enabled a better understanding of those areas where the cumulative impact of development has the potential to exacerbate flooding. The approach enabled easy identification of instances where locating development in the SWFZb Conveyance Zone had the potential to significantly alter flood flow paths and put the new development at risk of flooding, or where floodwater flow paths would be diverted to neighbouring areas and cause a detrimental impact.

Reproduced with kind permission from Brighton and Hove City Council.

12. Assessing and managing the impact of climate change on flood risk

Assessing the impact of climate change

National policy requires LPAs to:

- assess and map the effects of climate change on all sources of flooding,
- identify areas on maps where climate change is expected to increase flood risk,
- identify on maps where the effects of climate change are expected to make existing development unsustainable. This can be used to identify options for relocation strategies, to locate development in high risk, unsustainable locations, to areas of lower flood risk.

Climate change guidance for [England](#) sets out a range of allowances to assess the impact of climate change on future risk from river, the sea and surface water. It is important a range of allowances is assessed to help inform assessment needs depending on the lifetime and vulnerability of a development.

These allowances are routinely applied when undertaking modelling studies for river and sea flood risk to consider the impact of climate change. Similar modelling can be done for surface water, to include consideration of climate change using the allowances for peak rainfall intensity. In some limited cases it may be reasonable to use proxies instead of modelling the impact of climate change using the allowances, but testing would need to be done to ensure this is a robust approach.

To date, there has been no guidance published on how to assess the impact of climate change on the risk of flooding from groundwater, sewers or reservoirs and other artificial sources. The local approach for if or how to apply climate change in a SFRA should be agreed in its scoping phase with the Environment Agency and LLFA.

As well as understanding the anticipated changes in flood risk as a result of climate change, it is also crucial to have a good understanding of the condition, ongoing management and future maintenance plans of existing flood infrastructure. Flood risk is likely to increase in the longer term in areas currently benefiting from defences, particularly if there are no plans to upgrade or maintain the defences to keep pace with climate change.

The SFRA primarily assesses flood risks but in areas of tidal flood risk they can also be used to assess wider coastal risks including erosion. This can be achieved by designating Coastal Change Management Areas (such as those seen in Waveney, Fareham and Havant Council), which can drive local policies. This can ensure that the impacts of climate change are understood and assessed when allocating development.

When undertaken collaboratively and with governance arrangements in place to own SFRA outputs, LPAs can develop stakeholder-endorsed flood adaptation plans and policies that enable existing communities to remain viable in the face of increasing flood risk.

Safeguarding land for current and future flood risk management purposes

LPAs need to take an active role in identifying within their development documents areas of land to be used now or in the future for flood risk management purposes. The SFRA should be used to clearly set out any designation of land for this.

These may be existing areas of a river floodplain that store water when rivers are in flood, or areas used to store surface water exceedance flows during heavy rainfall events. It is essential that these areas are marked as flood storage areas (and, in England, identified as flood zone 3b functional floodplain where appropriate) to ensure that they are not developed in the future and the flood storage function of these areas is protected. For non main rivers, the SFRA and local plan should consider safeguarding land adjacent to these. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain.

To enable communities to adapt to climate change and remain resilient to future flooding, space around and/or within a new development may need to be safeguarded where flood defences or other flood alleviation structures can be built in the future. Space may also be needed around existing flood alleviation structures so they can be expanded or set-back in future.

Alternatively, there may be currently developed areas that need to be earmarked for a change of use in the coming years to deliver a flood storage function; for example, areas of development within a flood zone which need to be converted back to floodplain to deliver a flood storage function, or areas that currently experience regular surface water flooding and ponding, and would make a natural area for flood storage. It may still be possible to use this land for water compatible⁴ uses, for example informal green spaces. In this case the LPA will need to take steps to communicate to users and local communities that the purpose of the land is primarily for flood storage. LPAs are also advised to keep records of areas designated for flood management.

In England, the PPG provides advice related to green belt compensatory measures. Where it has been demonstrated that it is necessary to release Green Belt land for development, strategic policy-making authorities should set out policies for compensatory improvements to the environmental quality and accessibility of the remaining Green Belt land. In a similar manner, LPAs should be encouraged and supported in their efforts to set out policies for safeguarding land for future flood risk management purposes.

Examples are provided below which have been assessed as “good practice” for considering climate change in SFRAs (Environment Agency research, 2021), and have links to where further information can be found.

Example: Managing the impact of climate change - Planning for relocation in areas of coastal change, East Suffolk Council

Description

The Development and Coastal Change Supplementary Planning Document (SPD) prepared for Waveney District Council, now East Suffolk Council, and adopted in 2013 set out the types of development that may be appropriate along the coast and how planning applications for development in the area were to be determined. It also provided guidance for home owners and businesses affected by coastal erosion including how relocation sites would be considered. The SPD policies were superseded and replaced in March 2019 on adoption of the new Waveney Local Plan, however, much of the content is still being used in relation to the new policies.

The SPD (2013) provided greater detail and clarity to these policies:

- Coastal Change Management Area (DM06)
- Relocation and Replacement of Development Affected by Coastal Erosion (DM07)
- Housing Development in the Countryside (DM22) (part)

It also provided information on the types of permitted development, and guidance for the following situations:

- Relocation and replacement of businesses affected by coastal erosion
- Relocation of dwellings affected by coastal erosion
- Mitigation measures and adaptation strategy
 - Use of article 4 directions in the coastal change management area
 - Use of conditions and section 106 agreements
 - Time limited developments

⁴ As defined in the [Planning Practice Guide Flood and Coastal Change Table 2](#).

- Short term reuse of existing residential properties

The council designated areas along its coastline as a Coastal Change Management Area (CCMA) in its local plan. CCMA's identify land likely to be affected by coastal change (e.g. erosion, landslip or permanent inundation by the sea). Within the Supplementary Planning Document (SPD) was a development matrix that set out the approach to development proposals within the CCMA based on development vulnerability and timescales beyond which maintaining buildings in their current location may become unsustainable.

Development Type	Short-term (up to 2025)	Medium-term (2025-2055)	Long-term (up to 2105)	
New Residential development, replacement dwellings or change of use to residential use	X	X	X	Not permitted under any circumstances.
New non- residential development not associated with an existing use or building	X	✓ / X	✓ / X	In short term risk area development not permitted under any circumstances. Subject to findings of the vulnerability assessment some types of development will be permitted in the medium to long term areas.
Temporary Uses	✓ / X*	✓	✓	Subject to findings of vulnerability assessment. *Except residential uses.
Open Land Use	✓	✓	✓	Subject to time limited conditions and findings of vulnerability assessment.
Changes of Use	✓ / X*	✓	✓	Change of use applications may be appropriate in some cases subject to time limited conditions. *Except residential uses.
Extensions (including householder development)	✓ / X	✓	✓	Extensions may be appropriate in some cases in the short term subject to findings of the vulnerability assessment and owners acknowledgement of risk.
Intensification of use (excluding residential uses)	X	✓ / X	✓ / X	Medium to long term increased use of these areas may be appropriate depending on the type of use and assessment of risk.
Re-development or reconfiguration of existing sites (excluding residential uses)	X	✓ / X	✓ / X	Subject to time limited conditions, findings of vulnerability assessment and owners acceptance of overall risk.
Replacement of Development Affected by Coastal Erosion (Policy DM07) (excluding residential development)	X	✓ / X	✓ / X	Assessment of the type of use and use of temporary conditions may make some replacement development acceptable within a lower risk zone.
Infrastructure and Community Uses	✓ / X	✓ / X	✓ / X	Essential infrastructure will be permitted in all risk areas where no other sites are feasible and a management plan for future removal and replacement is provided. Community uses will be permitted where the wider benefits outweigh the risks and are subject to a management plan.

- ✓ Development will be acceptable but may be subject to conditions
- X Development will not be accepted under any circumstances
- ✓/X Development may be acceptable subject to the findings of the CEVA and appropriate conditions

Figure 3 Development Matrix

Benefits

The SPD provided an easily understandable, robust approach for managing future development in areas likely to become unsustainable in the medium to long term due to coastal erosion. The development matrix shown in the figure could be adapted for any flood source where information is available to support decision making on long term sustainability of development locations.

By setting out the timescales within which certain types of development were appropriate it facilitated a common understanding between the LPA, developers and the public on how growth and regeneration within and around existing communities could be maintained without creating a long-term legacy of unsustainable

development. By having a clear, common understanding of what was, and was not, appropriate development it saved LPAs, flood and coastal management authorities and developers significant resources by focussing on compliant planning applications. *Reproduced with kind permission from East Suffolk Council.*

Example: Assessing the impact of climate change – online mapping of future levels of flood risk, Huntingdonshire District Council

Description

The mapping associated with the SFRA for Huntingdonshire (first published in 2017) is publicly accessible via an interactive web format. Flood risk from a range of sources (river, surface water, and groundwater) can all be viewed in one place, and the website includes a link to the report which explains all the information shown on the map.

As well as having maps showing the current risk of river flooding, the SFRA also had maps showing the future extent and severity of river flooding, incorporating the government's new climate change allowances.

Benefits

Landowners and developers are able to identify the future level of risk for sites of interest, providing more information upfront so a better understanding of the risk was known before investing resources into specialist flood risk assessments and planning applications.

Reproduced with kind permission from Huntingdonshire District Council.

Example: Managing the impact of climate change – building resilience through the Living with Water Partnership, Hull City Council

Description

Hull is very low-lying and within an area defined as Flood Zone 3. The majority of the city is defended from flood risk through the use of flood alleviation structures such as engineered walls, embankments, storage lagoons and pumping stations. The presence of the flood defences means that the probability of flood risk is low in much of the city but the consequences if they breach or overtop are high. There is also the additional challenge of local flood risk such as surface water, sewer and groundwater.

In Hull the majority of surface water from the city and surrounding areas has to discharge into the sewer system which then needs pumping to outfall. This integrated level of risk means that it needs a combined approach rather than looking at it as different sources of flood risk being managed by separate authorities. Hull City Council, East Riding of Yorkshire Council, Yorkshire Water and the Environment Agency have joined to form the 'Living with Water Partnership'. This partnership means there is a strong local understanding of the importance of flood risk management to accompany any new development.

A joint Supplementary Planning Document (SPD) has been produced between Hull City Council and Yorkshire Water with an agreed accepted run-off rate from all new development and promoting the use of blue/green infrastructure (sustainable drainage systems or SuDS) as the volumes of storage required will render traditional underground SuDS as unaffordable. This is also supported by an Open Space Strategy:

"Hull is at risk from tidal, ground and surface water flooding; reducing flood risk by capturing and slowing water during and after heavy rainfall can help to prevent localised flooding; in a city where the vast majority of properties lie in a floodplain the challenge of reducing flood risk becomes ever more important. Hull has a history of culverting waterways and a combined sewerage and drainage system exacerbates the situation, Hull's drainage systems are at capacity resulting in a number of properties being at risk of surface water flooding. Significant surface water flooding in 2007 and a tidal surge in 2013 make flood risk management a high priority for Hull. Retrofitting hydrological schemes in green spaces can incorporate design that provides

adequate storage for the site and that also leads to benefits in water quality and biodiversity". Extract from Hull City Council Open Space Strategy, 2016

Benefits

The benefits using the SFRA to create the SuDS SPD document are that, like the SFRA, the developers know what is expected of them and can negotiate land prices accordingly. It also means that the flood and drainage layout become an integral part of the development design, planned from the start rather than added in once a masterplan for the site has been produced. Alongside this work the Living with Water Partnership has concentrated on community engagement to promote personal resilience and to drive behaviour change so that people are demanding more resilient homes and multi- function green space to improve their environment.

Reproduced with kind permission from Hull City Council.

13. Identifying and using measures to reduce the risk of flooding

Flood risk management measures often tend to focus on ensuring that future development does not exacerbate the existing level of flood risk to the site and surrounding area. In England, the National Planning Policy Framework (NPPF) describes that residual flood risk should be managed by using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding (para 161 c), amongst other requirements. Developments that are subject to the exception test are also required to reduce flood risk overall, where possible. It is good practice for the SFRA to require all allocated and windfall sites to consider how betterment can be provided. This should include providing benefits outside of the red line boundary.

Risk management authorities may have information that can support LPAs to identify opportunities for betterment, or validate the SFRA findings, such as flood risk management scheme delivery programmes, and SuDS opportunity mapping.

The NPPF policy on SuDS requires their inclusion on all major development and all development in areas at risk of flooding. These policy and legal mechanisms provide increased opportunities to reduce existing levels of flood risk. The SFRA has a role to play in identifying opportunities for SuDS to be delivered in accordance with this policy at both the individual development scale and at the strategic scale.

Reducing the causes and impacts of flooding might involve development proposals which include:

- Development contributions for capital and maintenance investment in existing, new or improved FRM infrastructure
- area-wide SuDS to remove surface water from combined sewers
- shared or strategic large scale flood storage schemes, which benefit areas downstream not just the local area
- floodplain and channel restoration
- natural flood management or nature based solutions
- changes to land management
- surface water or river flood storage areas
- removal of culverts or other restrictions on flow
- river restoration, such as removing canalisation and re-introducing meanders
- removing permitted development rights in sensitive areas for example functional floodplains where cumulative losses of storage through extensions could have significant impacts or where increases in vulnerability through change of use would be inappropriate.

Flood Risk Management Authorities should be able to advise the LPA, both on areas of particular flood risk concern and appropriate approaches to reduce the causes and impact of flooding.

The SFRA can play an important part as the evidence base to inform policies that can deliver a reduction in the existing and future risk of flooding.

Examples are provided below which have been assessed as “good practice” for delivering flood risk reduction via the SFRA (Environment Agency research, 2021), and have links to where further information can be found.

Example: Delivering flood risk reduction through new development, East Riding of Yorkshire Council

Description

East Riding of Yorkshire Council have developed a 'Flood Risk Note for the Planning Application Process'. The purpose of the document was to assist developers, applicants, and LPA officers on how to use the council's SFRA and how to apply flood risk policy in the East Riding of Yorkshire. It aimed to promote transparency and consistency in the approach East Riding of Yorkshire Council will take to applying the flood risk sequential and exception tests.

The note was initially prepared in 2010 and updated in 2017 to reflect the adoption of the East Riding Local Plan and to incorporate best practice and updated in 2018 to reflect updated Sustainability Appraisal objectives.

'Step 6 - Preparing a site-specific FRA', sets out the requirement to consider how the development will contribute to a net reduction in flood risk:

"... applicants are encouraged to demonstrate that their proposals will deliver a positive reduction in flood risk overall, whether that be by reducing the frequency or severity of flooding (for example, through the introduction of SuDS) or by reducing the impact that flooding may have on the community (for example, through a reduction in the number of people within the site that may be at risk)".

"If it is impossible/difficult on-site to provide an overall reduction in flood risk, consideration needs to be given to whether a contribution to flood risk management infrastructure may be appropriate, supporting the area in which the development takes place (to be determined on a case-by-case basis)."

Benefits

The Flood Risk Note clearly set out the expectation for new developments so that a flood risk could be reduced in the area.

Reproduced with kind permission from East Riding of Yorkshire Council.

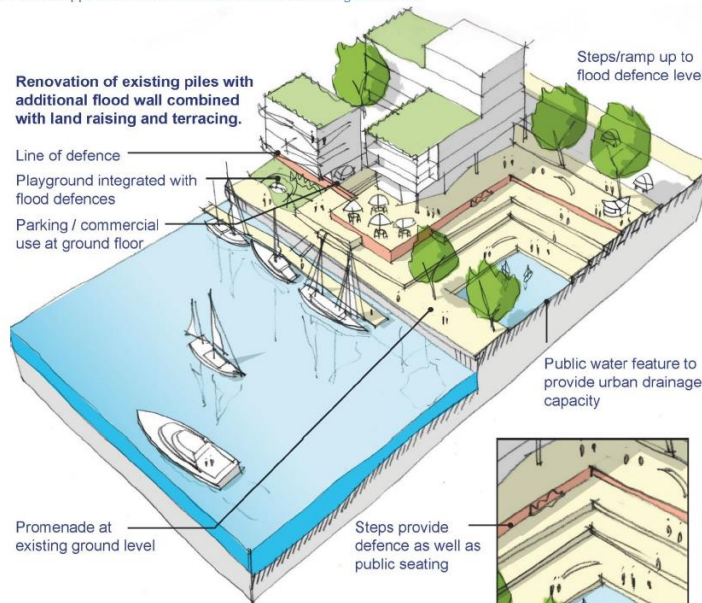
Example: Delivering flood risk reduction through new development, Shoreham Harbour, Adur District Council, Brighton and Hove City Council and West Sussex County Council

Description

The Shoreham Harbour 'Flood Risk Management Guide' Supplementary Planning Document (SPD) was produced in 2015. It was prepared collaboratively by the Shoreham Harbour Regeneration Partnership comprising Adur District Council, Brighton & Hove City Council, West Sussex County Council and Shoreham Port Authority, working closely with the Environment Agency.

The SPD forms part of the evidence base for the Shoreham Harbour Joint Area Action Plan which is a 15-year regeneration plan for the harbour area. It provides an example of how regeneration can be used as an opportunity to deliver a net reduction in flood risk.

Figure 7.13: Preferred Approach – Riverside Business Centre to Kingston Beach



Due to the greater flood depths along the Western Harbour Arm, this site was the focus for developing flood defence measures. A long list of options was determined by considering all possible flood defences for the Western Harbour Arm. These were then categorised and split into types and defence alignment. An options matrix was created to aid consideration of the feasibility of each of the flood defence types and to create a short list of options, based on the following key considerations:

- applicability
- cost
- maintenance
- adaptability
- design life
- environmental impact
- visual impact

Extract from Shoreham Harbour Flood Risk Management Guide SPD – Example of integrating methods to deliver net reduction in flood risk with regeneration.

Multi Criteria Analysis, which is a qualitative approach to identify preferences amongst different options, was used to facilitate the options selection process and to enable the relative merits of defence options to be assessed. A short list of preferred options was then produced and taken forward for concept design.

Based on the Multi Criteria Analysis, recommendations for preferred approaches were developed for the Western Harbour Arm. Flood resistance and resilience measures as well as sustainable drainage systems (SuDS) approaches were also recommended.

The SPD urban design goals are key to sustainable regeneration of Shoreham Harbour – these include promoting permeability and linkages through and across sites and enhancing the waterfront. As Shoreham is a built-up urban area, the aim was to integrate flood defences into regeneration, rather than have them act as physical barriers. This links to development proposals highlighted in the PPG.

Section 9 of the SPD presents guiding principles for planning applications. As well as flood risk, these seek to minimise and mitigate loss of intertidal habitat and associated biodiversity and manage water quality associated with surface water runoff.

Benefits

The SPD will support the construction of development which will be safe for its lifetime and delivers higher levels of flood defence and mitigation within the regeneration area than currently exists. In this way it helped deliver a reduction in flood risk in this area.

Reproduced with kind permission from the Shoreham Harbour Regeneration Partnership.

14. Guidance on requirements for windfall sites

The site allocations within a local plan set out the sites where a LPA wishes to see development take place. However, there will be instances where other parties subsequently propose development (residential and non-residential) in additional areas, which are referred to as ‘windfall’ sites.

Windfall applications should be considered at the strategic level through a policy, underpinned by the sequential test to steer sites away from areas at risk of flooding. The acceptability of windfall applications in flood risk areas should be considered at the strategic level through a policy setting out broad locations and quantities of windfall development that would be acceptable or not in sequential test terms. In the event of there being no windfall policy, the Local Authority must apply the sequential test on a site-by-site basis. It may be possible for the Local Authority to apply the sequential test, taking into account reasonably available sites, historic windfall rates and their distribution across the authority area relative to Flood Zones or other sources of known risk.

In England, the PPG states that the sequential test needs to be applied to windfall sites. Although that can be done at the planning application stage, that approach can entail significant resource implications for LPAs and developers in assessing and agreeing on a case by case basis whether the proposed development is appropriate for the level of flood risk that is present. Evidence, from the SFRA, should be used to review, challenge and reject sites if necessary.

By ensuring a SFRA adequately considers the flood risk in additional areas to those proposed for development by the LPA, a more robust evidence base can be created for developers to use early in their consideration of where to locate development proposals, and for local authority development management officers to use in determining the suitability of windfall development applications.

The sequential test should be applied to windfall sites unless those sites have already been sequentially tested using the SFRA. Where the appropriate test has not been applied to a site, the developer will need to provide evidence to the LPA that they have adequately considered it against other reasonably available, lower risk sites, suitable for that type of development, e.g. housing.

Planning applications for development on windfall sites where the sequential test has been applied satisfactorily may also be subject to the exception test requirements.

Examples are provided below which have been assessed as “good practice” for developing approaches to windfall sites in SFRAs (Environment Agency research, 2021), and have links to where further information can be found.

Example: Setting an approach for applying the Sequential Test to windfall sites, Dover District Council

Description

As part of their SFRA Dover District Council has produced ‘Site-Specific Guidance for Managing Flood Risk’ to provide general advice and clear guidance for planners and developers on how to submit information relating to flood risk in support of planning applications. One of the objectives of the document is to provide a district wide risk map with clear accompanying guidance to enable both the sequential test and exception test to be applied.

The guidance defines four geographical search areas that should be used when applying the sequential test to windfall sites in the district and lists the source documents from which developers should find the comparator sites for the assessment.

The guidance then sets out the approach for how the comparator sites should be compared against one another with respect to flood risk, using 3 levels of assessment:

Level 1: Compare using Potential Risk of Flooding Map

This map has been created by the council by amalgamating the three Environment Agency datasets: ‘Flood Maps for Planning’ showing areas which could be affected by flooding from rivers or the sea, ‘Flood Risk from

Surface Water' and 'Flood Risk from Reservoirs'. These datasets are combined to show one zone across the district where there is potential risk of flooding.

Level 2: Compare using Environment Agency Flood Map

Using the matrix below, assess whether any of the comparator sites are at lower flood risk than the application site based on Environment Agency's online mapping.

GUIDANCE: For each comparator site, fill out the matrix below, which shows the combined risk of flooding based on mapping hosted by the EA;

- 'Flood Map for Planning' – <https://flood-map-for-planning.service.gov.uk/>
- 'Flood Risk from Surface Water' – <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

		EA's 'Flood Risk from Surface Water' map		
		Very low	Low risk	Medium – high risk
EA's 'Flood Map for Planning'	FZ1	Very low	Low risk	Medium – high risk
	FZ2	Low risk	Low risk	Medium – high risk
	FZ3	Medium – high risk	Medium – high risk	Medium – high risk

Table 2.2 – Comparison of sites using EA's 'Flood Map for Planning' and 'Flood Risk from Surface Water'

ANSWER: No - Both the application site and all comparator sites are located entirely in a red box. The sequential test is passed. Alternatively, both the application site and all comparator sites are located entirely in an orange box. The sequential test is passed.

ANSWER: Yes – The application site is located in a red box, but any of the comparator sites are located in an orange box. The sequential test is failed.

Level 3: Compare using modelled flood level

The risk of flooding can be further interrogated to determine whether any of the comparator sites are at a lower risk of flooding than the application site. In addition to the Environment Agency's RoFSW mapping, modelled flood levels for flooding from rivers and the sea can be requested from the Environment Agency (Product 4 data request).

Benefits

The methodology has been set out by Dover District Council for applicants to follow. The methodology incorporated a range of flood sources, rather than solely flood zones associated with the risk of flooding from rivers and/or the sea.

Reproduced with kind permission from Dover District Council.

Example: Preventing windfall development in flood risk areas, Sheffield City Council

Description

Policy CS67 in the Core Strategy for Sheffield City Council sets out the requirements for flood risk management over the plan period to 2026. As the council had identified sufficient sites for housing until 2016/2017, the flood risk management policy included a clause that housing in areas with a high probability of flooding would not be permitted before 2016/2017. This means that sites not having a current planning permission in the highest risk areas, specified by the council could only be considered for housing development from 2016/2017, and then only subject to adequate safeguards being ensured.

Benefits

Introduction

Outcomes

Checklist

Good practice

Policy CS67 effectively applied the sequential test to potential residential development sites that come forward as windfall sites in these highest risk areas.

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15. Safely managing residual risk

Once the steps of assess, avoid, and reduce flood risk have been taken, the residual risk of flooding needs to be mitigated and safely managed within tolerable or acceptable thresholds (as deemed by the LPA).

After the sequential test has been applied, development may still need to go ahead in areas at risk of flooding although the sequential approach should be applied to ensure more vulnerable uses are directed to areas of a site with lowest risk. In these cases, it needs to be demonstrated that the development can be made safe throughout its lifetime without increasing flood risk elsewhere, in addition to being appropriately flood resistant and recoverable. It also needs to be demonstrated that residual risks can be safely managed over the development's lifetime.

The need to design a development to safely manage any residual risk of flooding equally applies to areas of lower flood risk, where housing may be allocated for example, as it does to areas of high risk.

The approach to safely managing residual flood risk will vary depending on the source of flooding and the local characteristics of the risk (e.g. depth of flooding, velocity of floodwater, rate of onset, warning periods – refer also to [Good Practice 5: Taking account of specific local flooding characteristics](#)) as well as the type of development and the vulnerability of the occupants. It will need to be considered by the LPA, based on the local context and in close consultation with the local authority emergency planning team, the Environment Agency and LLFA and defined in the SFRA. They may draw on the technical research report [Flood Risk Assessment Guidance for New Development FD2320](#) which provides the current advice on the topic. A site specific Flood Risk Assessment setting out this approach also needs to be undertaken by the development to support a development proposal, separate to the SFRA and local plan process.

For flood risk management and mitigation to be effective, emergency planning authorities need to be involved early on in the SFRA, particularly if development in areas at flood risk cannot be avoided. The emergency planning authorities can advise on managing community safety, planning for incidents and evacuations, appropriate access/escape routes, impact on blue light services, and providing for business continuity.

Where strategic issues affecting emergency services are identified in the SFRA, it may also be relevant to contact the local resilience forum (LRF) which co-ordinates preparation for local incidents and catastrophic emergencies through its multi-agency flood plan. Further information on this can be found in guidance on [Flood Risk Emergency Plans for New Development](#) (ADEPT and the Environment Agency, 2019).

The following provides an indication of the type of issues that should be discussed and agreed between the emergency planning authorities and development management teams:

- minimum floor levels for sleeping accommodation, relevant to anticipated flood extents and depths (hazard) on site
- requirements for safe refuge
- requirements for the provision of safe access/escape, this should consider land within and outside the red line
- production of emergency plans, evacuation plans and flood warning plans
- production of local guidance and local consultation arrangements
- flood response and emergency service infrastructure capacity issues
- resilient and resistant methods of construction, materials and design
- prohibited use of ground floor or basement dwellings in areas of increased risk

Introduction

Outcomes

Checklist

Good practice

Examples are provided below which have been assessed as “good practice” for safely managing residual risk in SFRAs (Environment Agency research, 2021), and have links to where further information can be found.

Example: Evacuation procedures, Hull City Council

See: [Evacuation procedures, Hull City Council in Good Practice 5](#)

Example: Setting clear requirements safe development and emergency planning, Southampton City Council

Description

The Southampton Coastal Flood and Erosion Risk Management Strategy is a non-statutory document that was finalised in 2013, with a focus on long term management of the 22km of stretch of the city's coastline spanning from Woodmill to Redbridge. Preferred options were selected for managing sea flood risk in each sub area along the coastline, and when implementation is likely to be required in order to reduce sea flooding to people and property.

The Level 2 SFRA, published for Southampton City Council in May 2017, provides information on the flood risk in Southampton, and acts as a technical evidence base to inform how the options set out in the strategy can be delivered. The aim is to view new development as a process which provides opportunities for betterment and improvement, rather than a negative process that requires mitigating. This is achieved in the following ways:

- The SFRA is a technical evidence base to inform the development of local policies in Southampton.
- The SFRA sets out requirements for how new development should contribute to successful sea flood risk management at the site level, and the strategic level. This might be through safeguarded land for future raising, financial contributions to provide flood defences or raise land.
- The SFRA sets out requirements regarding 'safe development' for each type of development, as shown in extract below. This provides expectations regarding building design, finished floor levels, access arrangements and production of emergency flood plans.

Finished floor levels of single storey buildings must be a minimum of 300mm above design flood event level.

Internal services capable of operation during design flood event.

Multi-storey buildings to have habitable rooms a minimum of 300mm above design flood event level.

Where ground floor of multi storey buildings flood, flood hazard should be classified as 'low' and resilience and resistance techniques should be adopted in design.

All site users to be placed on Environment Agency Flood Warning Register (Flood Warning Direct).

All site users to receive a Site Flood Plan from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood and appropriate emergency contact details.

More Vulnerable

Development Safe from Flooding

Development	Site Specific Flood Risk Management		Residual Flood Risk Management	
	Within Design Flood Event		Within Extreme Design Flood Event	
Access Requirements	Site Design Requirements	Safe Access Requirements	Site Design Requirements	Emergency Response Requirements
Development is afforded 'dry' by virtue of the defence, or where possible, alternatives should be sought to levels above breach flood - unless hydraulic modelling results (accepted by the Council) indicate that the depths are lower than indicated in this area, based on Flood Zone compatibility.	The site should remain operational and safe for use. The safety will be dependent upon the particular function of the essential infrastructure and should be agreed with the Environment Agency.	Prepare a site flood plan, in consultation with SCC emergency planners, local resilience forum, and with reference to the Multi Agency Flood Plan. Emergency services must be afforded access in extreme flood events. As a guide, flood depths to provide emergency access should not exceed 0.9m where velocities remain low, however the emergency services should be consulted in preparing development proposals.	The site should remain operational and safe for use. The safety will be dependent upon the particular function of the essential infrastructure and should be agreed with the Environment Agency.	Emergency services must be afforded access in extreme flood events. As a guide, flood depths to provide emergency access should not exceed 0.9m where velocities remain low, however the emergency services should be consulted in preparing development proposals.
Finished floor levels of single storey buildings must be a minimum of 300mm above design flood event level.	Internal services capable of operation during design flood event.	Where 'dry' access is not available, flood hazard on access routes out of the floodplain should remain 'low' (e.g. flood depth should not exceed 250mm where velocities are low).	Finished floor levels/entrance levels of permanent buildings should be set to a minimum of 300mm above design flood level. Mobile homes or caravans intended for permanent occupancy must be located on ground a minimum of 300mm above design flood level.	Prepare a site flood plan, in consultation with SCC emergency planners, local resilience forum, and with reference to the Multi Agency Flood Plan. Emergency services must be afforded access in extreme flood events. As a guide, flood depths to provide emergency access should not exceed 0.9m where velocities remain low, however the emergency services should be consulted in preparing development proposals.
Multi-storey buildings to have habitable rooms a minimum of 300mm above design flood event level.	Where ground floor of multi storey buildings flood, flood hazard should be classified as 'low' and resilience and resistance techniques should be adopted in design.	Where necessary, access routes should be signposted, and all site users made aware of 'safe access' routes. A suitable Site Flood Plan should be developed prior to occupation.	Where development includes ground floor habitable rooms, finished floor levels/entrance levels must be set a minimum of 300mm above design flood levels to prevent water ingress. Where possible, multi-storey buildings should locate habitable rooms a minimum of 300mm above design flood levels. Where this is not possible, they should be classified as single storey buildings.	Emergency services must be afforded access in extreme flood events. As a guide, flood depths to provide emergency access should not exceed 0.9m where velocities remain low, however the emergency services should be consulted in preparing development proposals. A suitable Site Flood Plan should be developed prior to occupation.
All site users to be placed on Environment Agency Flood Warning Register (Flood Warning Direct).	All site users to receive a Site Flood Plan from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood and appropriate emergency contact details.	All site users to be placed on Environment Agency Flood Warning Register (Flood Warning Direct).		
All site users to receive a Site Flood Plan from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood and appropriate emergency contact details.		All site users to receive a Site Flood Plan from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood and appropriate emergency contact details.		

Southampton Level 2 SFRA

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(Level 2 SFRA, Table 14 Safety Matrix – Making New Development Safe from Flooding, page 75).

Benefits

Applicants can access information on what will be considered safe development in the city. The SFRA facilitates early consideration of safe design and emergency planning measures for new development. Guidance is available for developers on how new development can be delivered in ways consistent with the wider strategy whilst safeguarding land needed for future flood risk management measures.

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16. Using the SFRA to inform plans and strategies

Completing the SFRA document, or indeed any other flood risk management document or plan, is not an end in itself. It is vital that the findings of these documents are applied by LPA officers and relevant risk management authorities to inform subsequent plans and strategies to inform how risk of flooding is managed and to create sustainable communities.

Using the SFRA for spatial planning and development management

The SFRA will help the planning authority make decisions about:

- The [local plan](#) or spatial development strategy, informing strategic and site specific policies, and the allocation of sites for development
- individual planning applications
- how to adapt to climate change
- future flood management
- emergency planning (the resources needed to make development safe)
- further modelling or assessment requirements to support planning proposals and Flood Risk Assessments

It will also be used to:

- carry out the [sequential test](#) for the local plan or spatial development strategy, and individual planning applications (windfall sites)
- apply the [exception test](#), where the SFRA proposed to allocate land for development in flood risk areas, and individual planning applications (windfall sites)
- establish if a development can be made safe without increasing flood risk elsewhere
- decide when a flood risk assessment will be needed for individual planning applications
- identify if proposed development is in functional floodplain
- do the sustainability appraisal of the local plan or spatial development strategy
- determine how a site may contribute to betterment or strategic flood risk management at the catchment scale

Flood risk management related plans and strategies

The SFRA can be used by relevant risk management authorities to inform a range of flood risk management plans and strategies, including:

- Surface water management plans (lead local flood authorities)
- Drainage and wastewater management plans (water and sewerage companies)
- Shoreline management plans (coastal protection authorities)
- River basin management plans (Environment Agency)
- Local, regional or catchment-level flood risk management strategies (all RMAs)
- Individual flood risk management schemes (all RMAs)
- Inform updates to the local flood risk management strategies (lead local flood authorities)

The flood risk information and resulting recommendations within these documents should be used to inform land assessment studies, future development allocations, development management policies, emergency plans, planning obligations (including Community Infrastructure Levy, Section 106 or Section 278 Agreements, etc.), and future relocation planning.

Green and blue infrastructure related plans and strategies

It is important that the findings from flood risk evidence base documents are used appropriately to inform meaningful planning policies and other plans and strategies being produced by the LPA and other organisations. One of the core local government activities is to undertake and co-ordinate projects and activities in such a way as to deliver multiple wider benefits. Through careful planning, activities to manage flood risk may be incorporated into other strategic plans and projects to deliver benefits in other areas, such as improving health and wellbeing, local economy, skills and employment, reducing emissions and supporting biodiversity. The East Solent Coastal Partnership is one example of where this is happening in practice (<https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Events/Conferences/Mark-Stratton-Broader-Outcomes-and-Place-Shaping.pdf>).

In addition to local plans and neighbourhood plans, the SFRA could support other strategies/plans, particularly those that include green and blue infrastructure policies, such as:

- Infrastructure delivery plan
- Capital strategy
- Local transport plans (produced by county councils / unitary authorities)
- Local industrial strategies
- Local enterprise partnership strategic economic plans
- Green infrastructure/open space strategies
- Planning obligation supplementary planning documents
- Statements of common ground (supporting the Duty to Cooperate in England)
- Local nature recovery strategies
- Design guides.

These plans and strategies should complement the findings of the SFRA, as well as wider policies set out in local flood risk management plans and the national flood and coastal erosion risk management strategy (Environment Agency, 2020).

Examples are provided below which have been assessed as “good practice” for using the SFRA to inform local plans and achieve wider outcomes (Environment Agency research, 2021), and have links to where further information can be found.

Example: Using the outputs of the SFRA to inform policies, Cornwall Council Local Plan Policy

Description

A Level 1 SFRA for Cornwall was produced in 2008-2009 with input from Cornwall County Council (now Cornwall Council) (Strategic Policy, Hydrology, Natural Resources, Highways and Emergency Management), district councils, the Environment Agency and South West Water. It was developed to support the Core Strategy at that time, which was later replaced by the local plan.

The findings of the SFRA were used to develop specific local policy, specifically Policy 26 in the local plan on flood risk management and coastal change. In particular policy 26 strives to achieve overall reduction in flood risk and increase in flood resilience. There is also an emphasis within the policy to support community-led local solutions to managing flood risk and coastal change. The policy is set out below:

Policy 26 Flood risk management and coastal change

1. Development should take account of, and be consistent with, any adopted strategic and local flood and coastal management strategies including the Shoreline Management Plan and Catchment Flood Management Plans for Cornwall and the South West River Basin Plan.
2. Development should be sited, designed, of a type and where necessary relocated in a manner that;
 - a. increases flood resilience of the area taking account of the area's vulnerability to the impacts of climate change and coastal change and the need to avoid areas of flood risk, in the first instance, taking into account the vulnerability of the use proposed; and
 - b. minimises or reduces and where possible eliminates flood risk on site and in the area; and
 - c. enables or replicates natural water flows and decreases surface water runoff, particularly in Critical Drainage Areas, through SuDS, utilising green infrastructure where possible and as guided by local standards, including Cornwall drainage guidance; and
 - d. the safeguarding of land, where it is identified to be fictional flood storage, to make space for water at times of flood; and
 - e. where applicable, supports community-led local solutions to managing flood risk and coastal change; and
 - f. does not create avoidable future liability for maintenance for public bodies and communities.
3. Development proposals of 10 dwellings or more or over 0.5 ha should provide a long-term water management plan, which includes maintenance of surface water drainage systems, measures to improve the network of surface water drainage systems on and around the site (e.g. culverts etc.) and identifies opportunities for future enhancement.

Benefits

The findings of the SFRA were used to directly influence a local policy for the area.

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Example: Using outputs to inform other plans and strategies, Worcestershire Minerals Local Plan, Worcestershire County Council

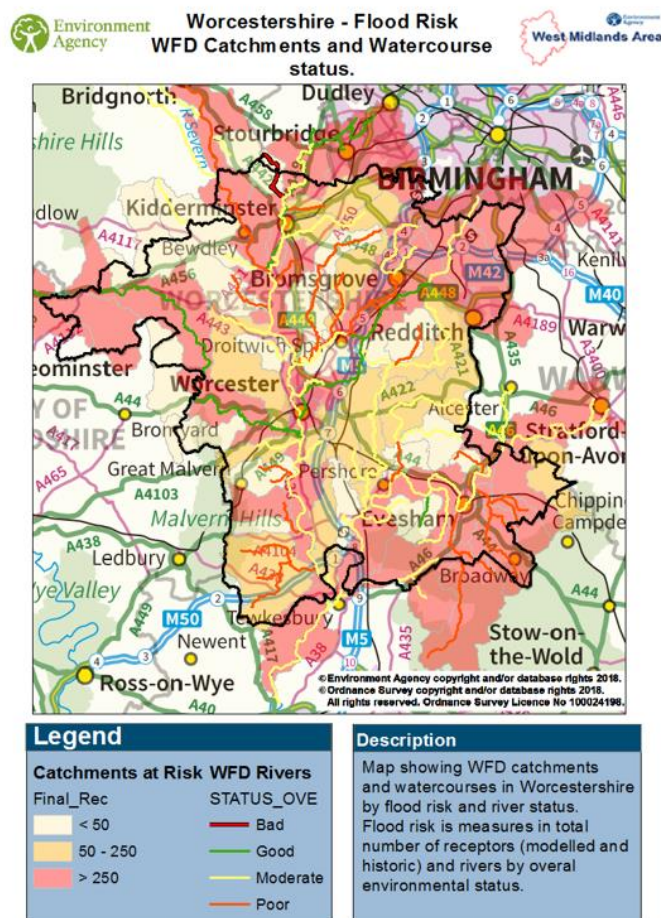
Description

A key driver of the Worcestershire Minerals Local Plan was to consider the potential for mineral development in the county to have a positive influence on green infrastructure.

A 'Technical Background Document - Catchment based management in Worcestershire' was prepared by Worcestershire County Council and Environment Agency West Midlands area in June 2018. The document combined datasets on flood risk, water quality and river morphology pressures and overlaid this information onto river catchment boundaries. This enabled greater understanding of the green infrastructure potential of

various locations, based on the evidence of flood risk and water quality within each river catchment. A

Figure 5. Flood risk and WFD watercourse status



Extract from Technical Background Document.

Benefits

Data on problems associated with flood risk, water quality and river morphology could be effectively combined and the potential for assessing appropriate green infrastructure solutions on a catchment wide basis.

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a mapping tool for Worcestershire was produced, which brought together an assessment of multiple datasets into a single catchment-based approach. This enabled effective evidence-based flood risk management infrastructure and Water Framework Directive measures to be targeted. The overarching aims were:

- For all new developments to prevent a deterioration in any Water Framework Directive status, improve resilience to flooding and deliver a reduction in overall flood risk, wherever possible.
- To use the mapping tool to embed a catchment-based approach in which the targeted delivery of flood risk management infrastructure and Water Framework Directive measures are appropriate in both scale and location to the proposed development.
- To use a catchment-based approach to provide multifunctional green infrastructure benefits.
- To use the evidence as a basis for encouraging proactive engagement between developers and both the county council, as the lead local flood authority, and the Environment Agency, to identify and assist the appropriate delivery of multifunctional flood risk management infrastructure to achieve betterment.

Example: Using outputs to inform other plans and strategies, Southampton Coastal Flood and Erosion Risk Management Strategy, Southampton City Council

Description

The Southampton Coastal Flood and Erosion Risk Management Strategy is a non-statutory document that was finalised in 2013, with a focus on long term management of the 22 km of stretch of the city's coastline spanning from Woodmill to Redbridge. Preferred options were selected for managing sea flood risk in each sub area along the coastline, and when implementation is likely to be required in the future in order to reduce coastal flooding to people and property.

The Level 2 SFRA for Southampton City Council, prepared in 2017, sets out how the options in the strategy can be delivered. The findings from the Level 2 SFRA were used by LPA Officers to inform future planning in the City; LPA Officers led changes to planning policies as well as development management requirements. LPA Officers viewed new developments as opportunities for betterment and improvement, rather than a negative process that requires mitigating. This was achieved in the following ways:

- Planning Officers used the SFRA to inform the development of local policies in Southampton.
- Clear requirements for how new development should contribute to successful flood risk management at the site level, and the strategic level, were set out in the SFRA for example, through safeguarding land for future flood defences.
- Clear requirements regarding 'safe development' for each type of development were provided in the SFRA, regarding building design, finished floor levels, access arrangements and production of emergency flood plans.

Benefits

The SFRA provided a review of the flood risk in the area and the existing strategy for managing that risk into the future. Through careful use of this information by LPA Officers, the SFRA was used to inform spatial planning policies and decisions that support new development. Guidance is available for developers on how new development can be delivered in ways consistent with the wider strategy whilst safeguarding land needed for future flood risk management measures. The SFRA also facilitates early consideration of safe design and emergency planning measures for new development.

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Glossary

ADEPT	Association of directors of environment, economy, planning and transport
CIWEM	Chartered institution of water and environmental management
CCMA	Coastal change management area
FCERM	Flood and coastal erosion risk management
FRA	Flood risk assessment
GIS	Geographical information system
ICM	Integrated catchment model
LFRMS	Local flood risk management strategy
LLFA	Lead local flood authority
LPA	Local planning authority
NPPF	National planning policy framework
PPG	Planning practice guidance
RMA	Risk management authority
RoFSW	Risk of flooding from surface water (maps)
SFRA	Strategic flood risk assessment
SPD	Supplementary planning document
SuDS	Sustainable drainage systems
SWFZ	Surface water flood zone
SWMP	Surface water management plan

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